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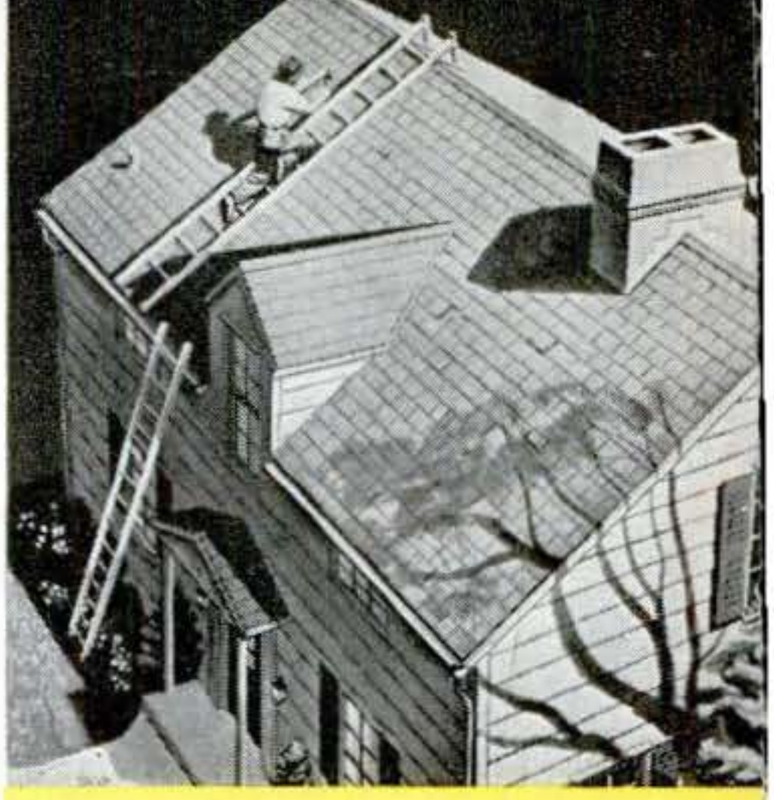
MECHANICS AND HANDICRAFT



Fix Your Roof Yourself – p.151

August, 1950
25¢

Super-Movies Put You in the Show

Thrills that lift you out of your seat . . . action that goes on right around you . . . These are the illusions created in a new kind of movie. Panoramic sight and sound put the action right in your lap! Fire engines seem to come

(CONTINUED ON PAGE 75)

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1951 MIDWEST TELEVISION

CONSOLES and COMPLETE CHASSIS *Featuring*
The New MAMMOTH
19½-Inch
BLACK PICTURE TUBE
At Low Factory Prices

FACTORY-TO-YOU

Never before have you seen such tremendously BIG, clear pictures, such luxurious cabinets, such sensationally low Factory Prices as Midwest offers in its 31st Anniversary Line of 19½" and 16½" TV Consoles, TV-Radio-Phono combinations, and complete TV Chassis. Features include: Mammoth 19½-Inch Picture Tubes (225 sq. in. image); 16½-Inch Picture Tubes (151 sq. in. image); Video-Sonic Tuner; big 12" Panasonic Speaker; Simplified One-Knob Tuning; Synchronized Sound and Picture, and many other outstanding features.

FACTORY AUTHORIZED SERVICE AVAILABLE IN TELEVISION AREAS

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MIDWEST Offers A Complete Line Of 19½-Inch and 16½-Inch TELEVISION Models

MIDWEST "CONSTELLATION" TELEVISION CONSOLE with GIANT 16½-Inch PICTURE

Another sensational Midwest Television value! A powerful BIG-PICTURE receiver in a strikingly beautiful Console Cabinet, provides 151 square inches of bright, clear, steady picture.

"CONSTELLATION" 19½-Inch Picture Tube TELEVISION CONSOLE

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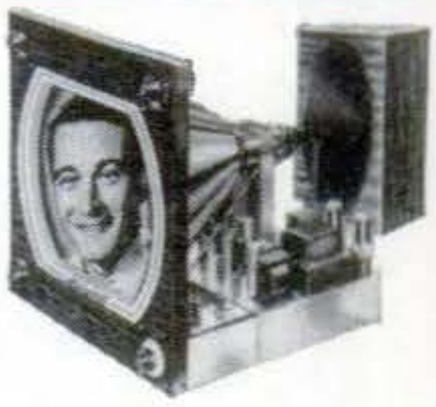
Complete 19½-Inch TELEVISION CHASSIS

Ready For Custom Installation In Your Own Cabinet. Just plug in, hear and view.



COMPLETE 16½-Inch TELEVISION CHASSIS

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...and TELEVISION Adapter CONSOLES and CHASSIS for Use with MIDWEST RADIOS

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Get MORE For Your RADIO and TELEVISION DOLLAR . . . BUY DIRECT From

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1951 MIDWEST Series 16 RADIOS

In Beautiful Consoles and Complete Chassis

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EASY TERMS

30 DAYS TRIAL

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Read What These Satisfied MIDWEST Owners Say:

"My Midwest Television Tops Them All"

Chicago, Ill.—I have given my new Midwest Video Grand Television-Radio Combination a thorough test and it has come through with flying colors. From the rich looking cabinet, the excellent AM and FM radio reception, to the perfect Television picture. My Midwest tops them all. We are proud to own a Midwest Television.

Eric A. Kroehnert
3135 N. St. Louis Ave.

"Better Than Sets Costing Twice As Much"

St. Albans, N.Y.—Our friends criticized us for ordering a Midwest Television by mail but when they saw our Video Grand they gasped in amazement at its perfection of tone and fine clear pictures. They tell us now that our Midwest is better than sets costing twice as much.

Frederick J. Wills
114-17—211 St.

"Amazed At The Precision Picture Control"

Santa Ana, Calif.—I wish to take this opportunity to heartily recommend the Midwest "Constellation" Television receiver which I purchased from you. My friends who see my Midwest Television are amazed at the precision picture control it provides. They are even more surprised at the price, which they usually guess is double the amount I paid.

L. C. Bullock
832 Cypress St.

"Midwest Is The Most In Radio For The Least Price"

Springfield, Mass.—To your potential customers I say this: Ask the man who owns one—and I'll answer for every Midwest Radio owner that Midwest is the most in radio for the least price.

Roy J. Harrington
104 Shattuck St.

"The Most Wonderful Tone You Could Ask For"

Detroit, Mich.—I am very well satisfied with my Midwest Symphony Grand Radio-Phonograph that I purchased from your factory more than a year ago. It has the most wonderful tone you could ask for and all my friends envy me for having such a wonderful set.

Donald Pfeiffer
6319 Baldwin Ave.

"Brings In London, England, Easily"

Hot Springs, Ark.—I received my new Midwest Series 16 Radio and I am certainly well pleased with it. It brings in London, England, easily as well as Canadian and other faraway stations. I have other different makes but my Midwest is the best of all. Thanks for making such good radios.

W. M. Street
Crystal Route 270

$24.00 Will Put This Beautiful 1951 SYMPHONY GRAND Radio-Phonograph In Your Own Home On 30 DAYS TRIAL

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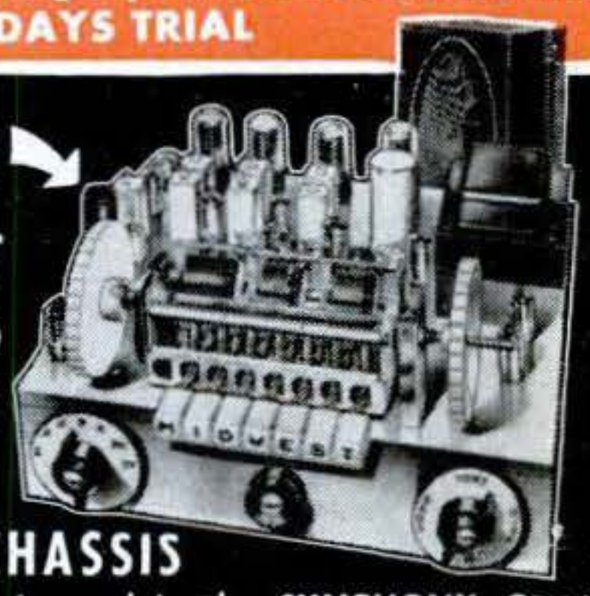

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Founded 1872. Vol. 157: No. 2

POPULAR SCIENCE
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Features FOR AUGUST, 1950

Super-Movies Put You in Show.... 74
Three projectors and six sound tracks wrap you in realistic sight and sound.

Ship-Launched Viking Rocket..... 84
Rising from the deck of a ship in mid-Pacific, a 50-foot Navy rocket soars to a record height.

Typewriter "Sets Type" on Film.... 93
Will this machine-with-a-memory be the biggest thing in printing since Gutenburg's bright idea?

Diver Battles Shark.....100
Don't take a poke at a shark—unless you are willing to bet your life you can outfight him.

TV for Everybody.....111
UHF slave station in Connecticut shows how your town could get big-city television.

Road Race Tests Cars and Men....116
Slithering around a highway loop, agile sports cars compete in a revival of early races.

Sun Furnace for Hottest Heat.....122
French scientists use an antiaircraft searchlight mirror to bring the sun down to earth.

Fix Your Roof Yourself.....151
Rain on the roof is pleasant—when it doesn't come in. Here are the tricks of tracing leaks.

New Furniture from Old.....158
Secondhand pieces are often sound, comparatively cheap—and ugly. But a fast refinish fixes that.

Gus and the Miracle Jeep.....162
Gus looks into the case of the engine that runs just as well under water as it does on top.

We Built a Family Theater.....174
When the cabinets multiplied like rabbits, this fellow called a halt, produced a supercabinet.

Manual Training for Housewives..201
School teaches New York goodwives to patch plaster, fix fuses, do what their husbands are too lazy to.

Renault Engine Easy to Get At..... 90
Film Package Is Camera..... 98
Undersea Pipe Taps Tanker's Oil..... 99
Models Show Way to Hide Antennas....105
One-Armed Robot for Hot Jobs.....106

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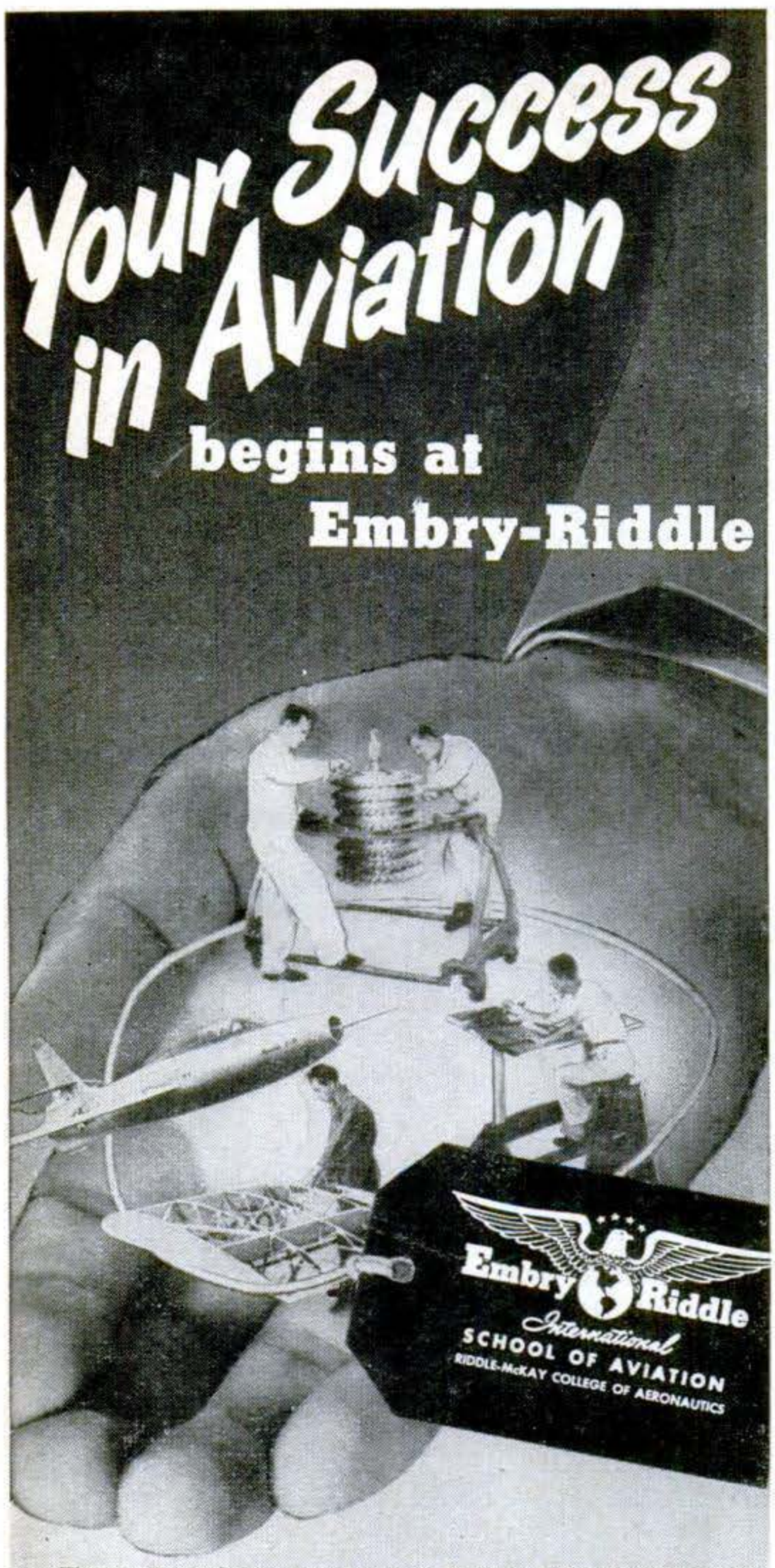

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How a Coaster Brake Stops a Bike.....108
World's Biggest Color Photo.....129
53 Million Tin Cans Every Day.....132
Plastic Road Rolled Out.....134
Obstacles Test Fork Drivers.....140
What It Takes to Drill a Well.....142
Autos Race in Your Back Yard.....145
Boxcar Gives "Pullman" Ride.....148

Mechanics & Handicraft

Sink Cabinet Adds Storage Space.....156
Ignition Timing Light for a Dollar.....167
We Mow Our Lawn with an Outboard..169
Folding Stool Saves Space.....172
TV's Images Can Be Photographed.....184
Twin-Image Cap Sharpens Photos.....187
Repair That Broken Blind Yourself.....191
Hose Unwinds While the Water Runs....193
Quick Milling Setups for Your Lathe....196
A Flying Wing You Can Build.....204
Back-Seat Box Satisfies Dog.....206
How to Repair Your Own Rugs.....210
How to Make a Windshield Washer.....215

Departments

Letters 8
New Ideas from the Inventors..... 79
Aids to Modern Living.....130
Keeping the Home Shipshape.....137
Hints from the Model Garage.....165
Built by PS Readers.....173
What's Wrong?.....183
New Shop Ideas.....188
I'd Like to See Them Make.....190
Mechanics of Farming.....226
New Tools.....242
P.S. Last Minute News and Notes.....246

Keeping a TV Photo-Scrapbook

NOTHING has as short a life expectancy as a TV image; even soap bubbles live long in comparison. If you've ever wondered how to preserve these evanescent flickers in your living room, take a look at the article on page 184. It tells how you can capture a permanent record of the memorable scenes that flash in over the air waves.

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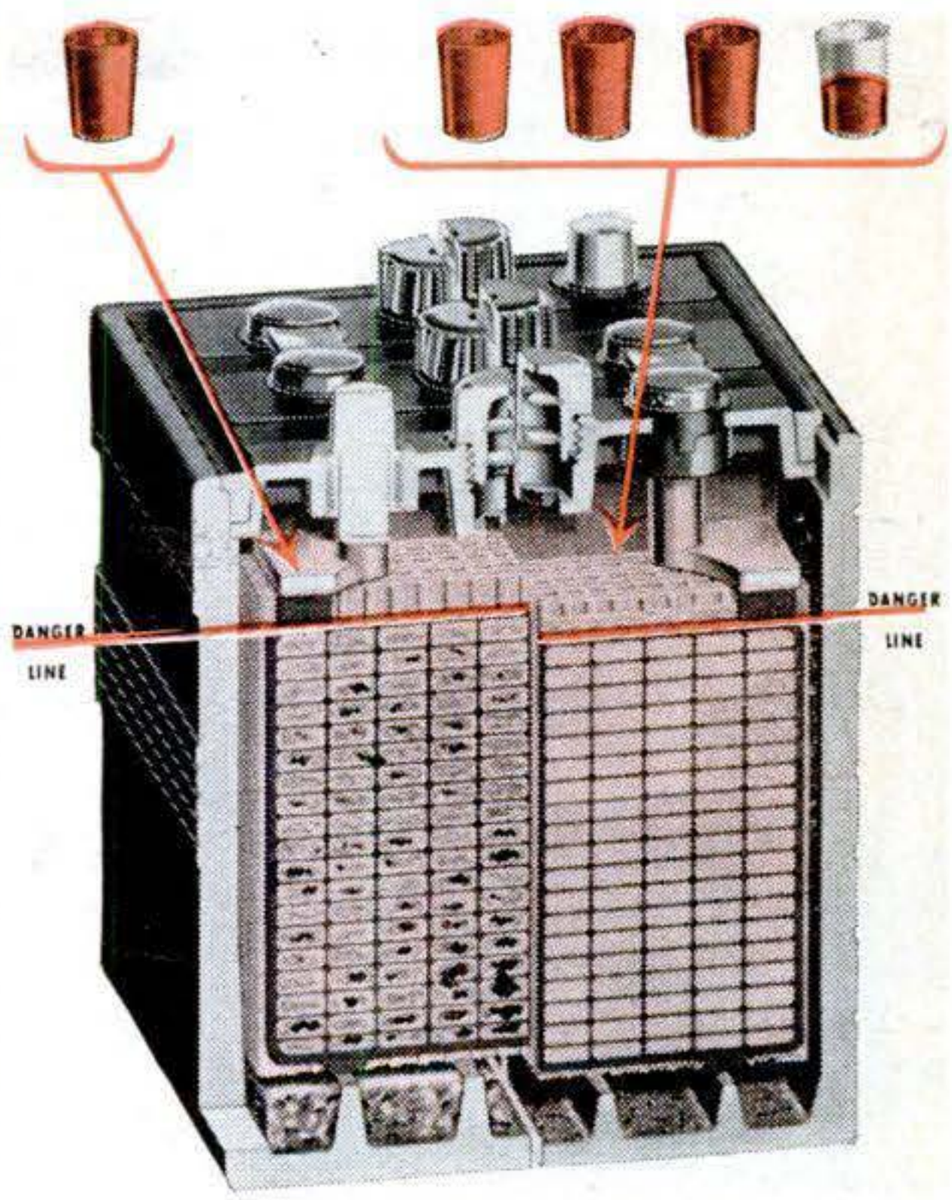

ORDINARY TYPE STA-FUL

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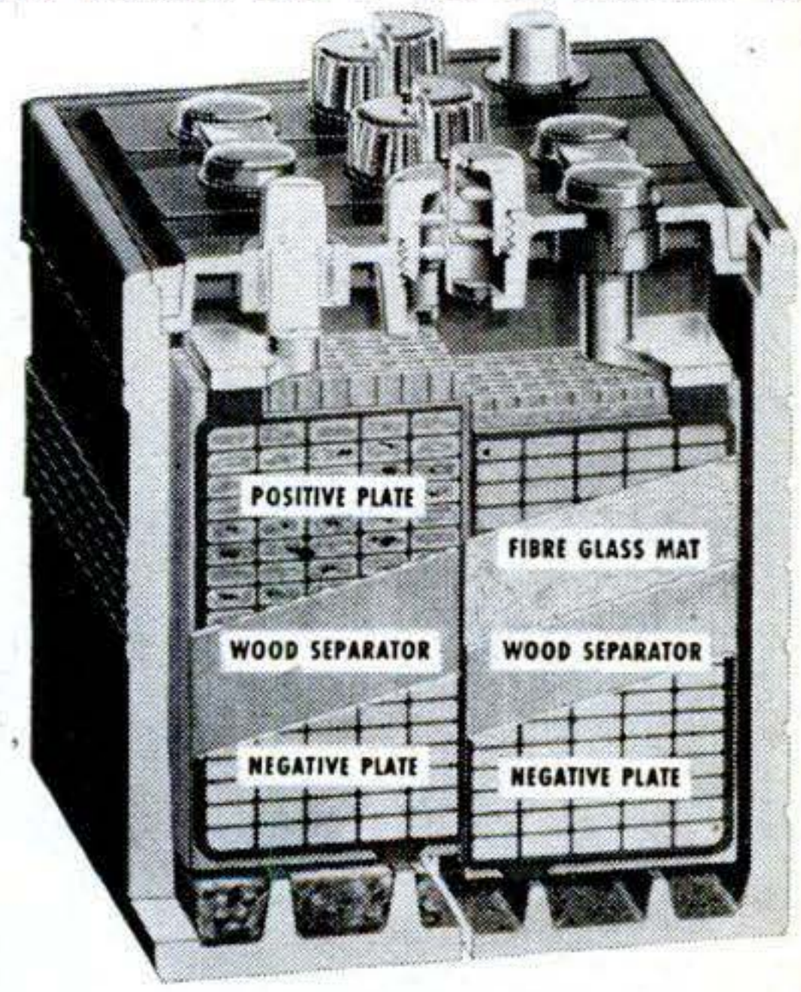

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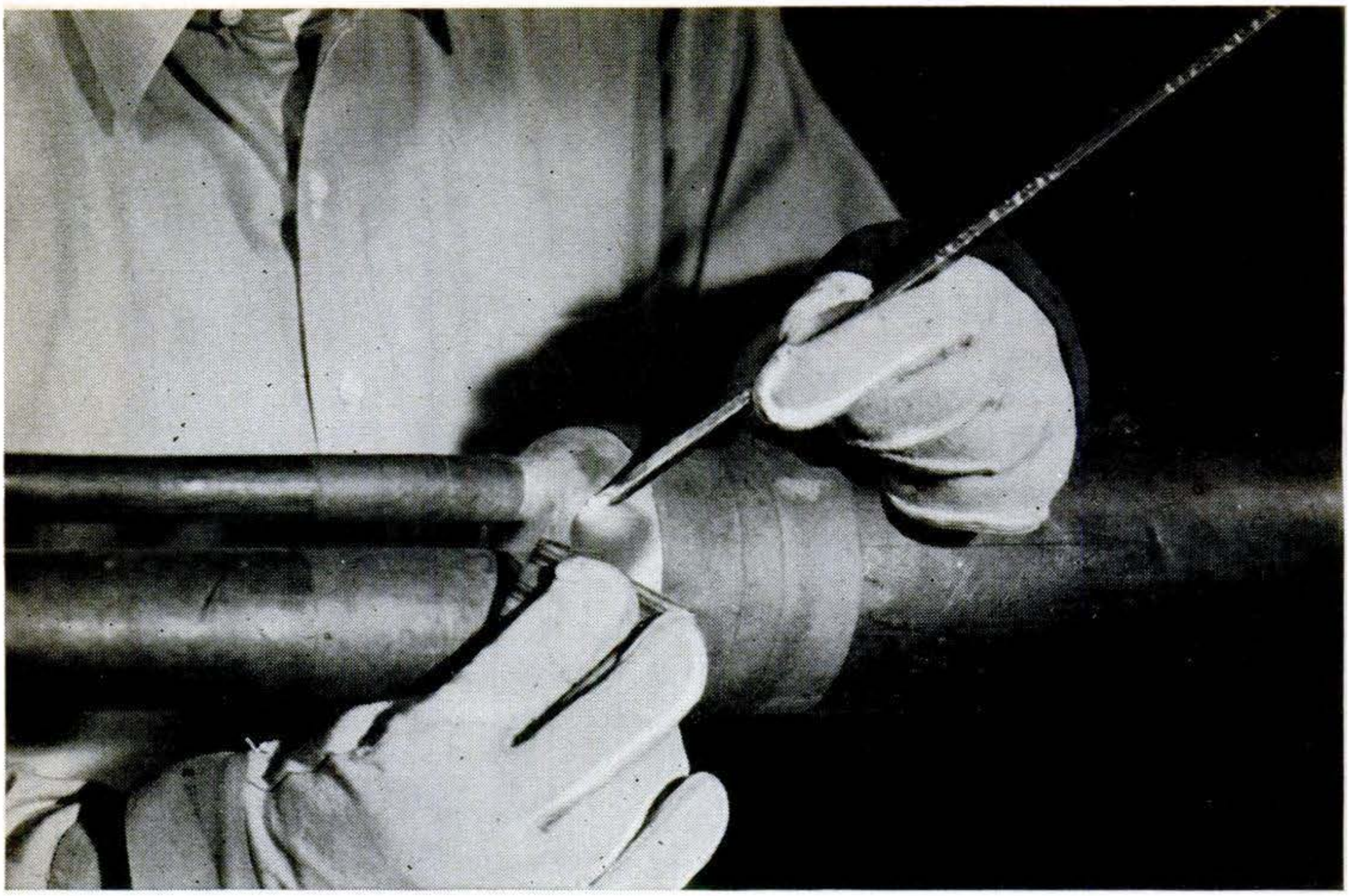

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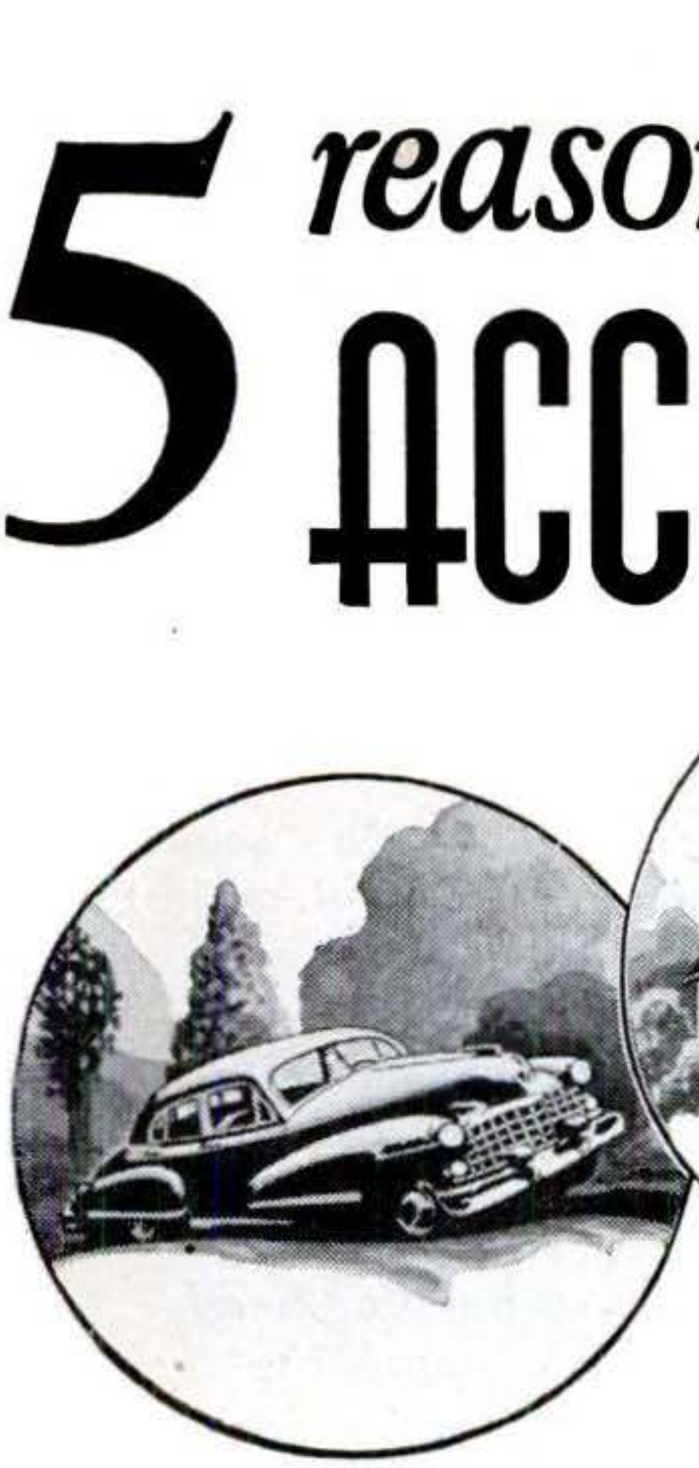

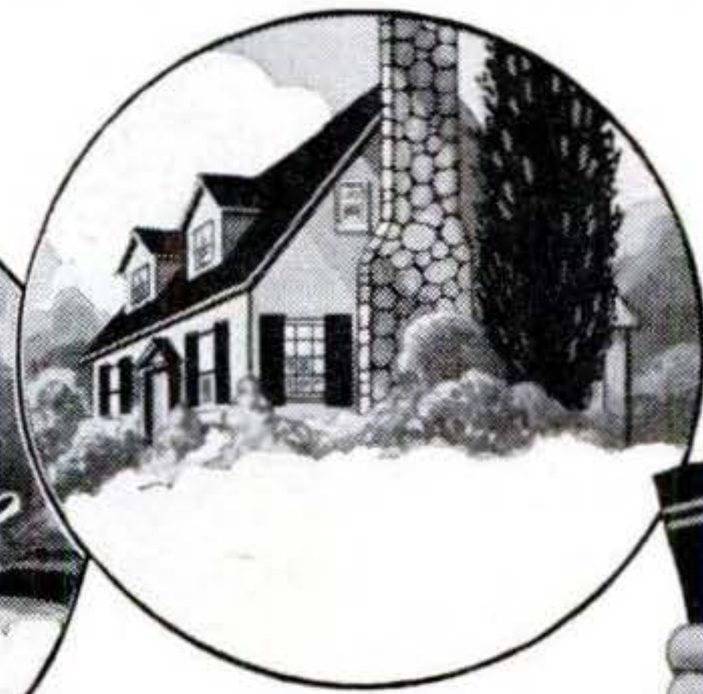

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Letters

Out of the Frying Pan . . .

Sir:

In your June issue, in the article on "Turbo Cars" [p. 98], I read that gas-turbine engines, so high-powered for their size, will enable a trailer truck to carry a heavier load without increasing the length.

Then in *Reader's Digest* for the same month, in an article entitled "The Rape of Our Roads," I read that over-loaded trucks are already tearing up the nation's highways faster than we can replace them.

M. Ellis Linsey

Seguin, Texas

Needed: cheaper ways of building tougher roads. For one possible approach, see p. 134.

How to Keep the Dust Out

Sir:

About your suggestion in April, p. 184, for using abrasives to adjust tappets: Wouldn't the abrasive dust find its way

into the bearings and other parts of the engine, resulting in a major repair bill?

Herman M. Rentz

Woodruff, S. C.

The garageman who made the suggestion says he took it for granted that any mechanic would know this must be prevented. Commonest method of control is to pack rags around work area, and remove grit by careful, moderate blasts from the air hose.

Silencer for Power Tools

Sir:

The article on "Soundproofing Your Shop"

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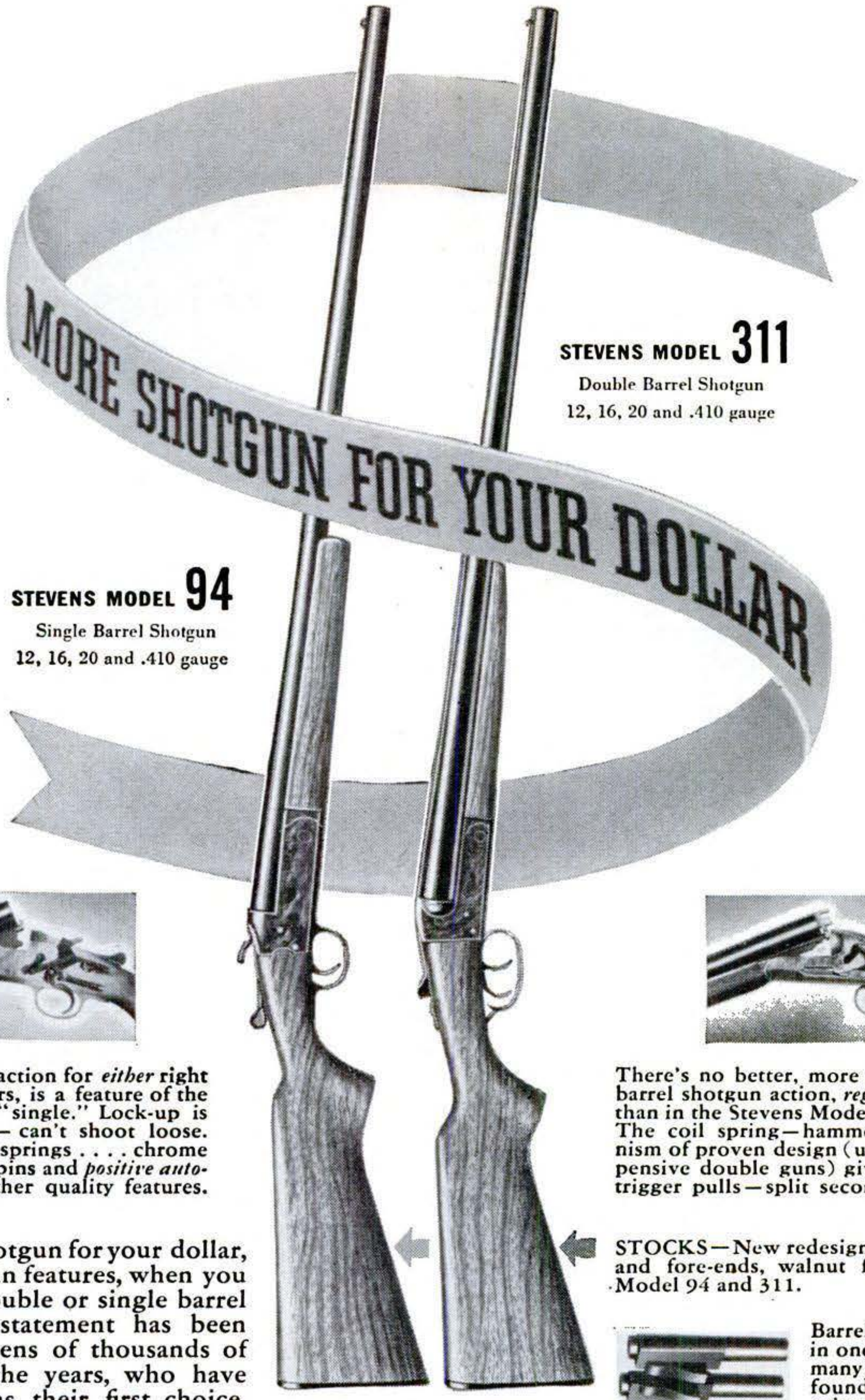
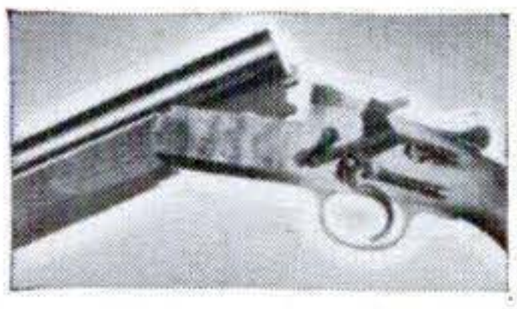


STEVENS MODEL 311
Double Barrel Shotgun
12, 16, 20 and .410 gauge

STEVENS MODEL 94
Single Barrel Shotgun
12, 16, 20 and .410 gauge



Two-way, top snap action for *either* right or left hand shooters, is a feature of the Stevens Model 94 "single." Lock-up is positive and rigid — can't shoot loose. Unbreakable coil springs . . . . chrome molybdenum firing pins and *positive automatic* ejector are other quality features.

There's no better, more reliable double barrel shotgun action, *regardless* of price than in the Stevens Model 311 "double." The coil spring—hammer—sear mechanism of proven design (used in most expensive double guns) gives clean, crisp, trigger pulls—split second hammer fall.

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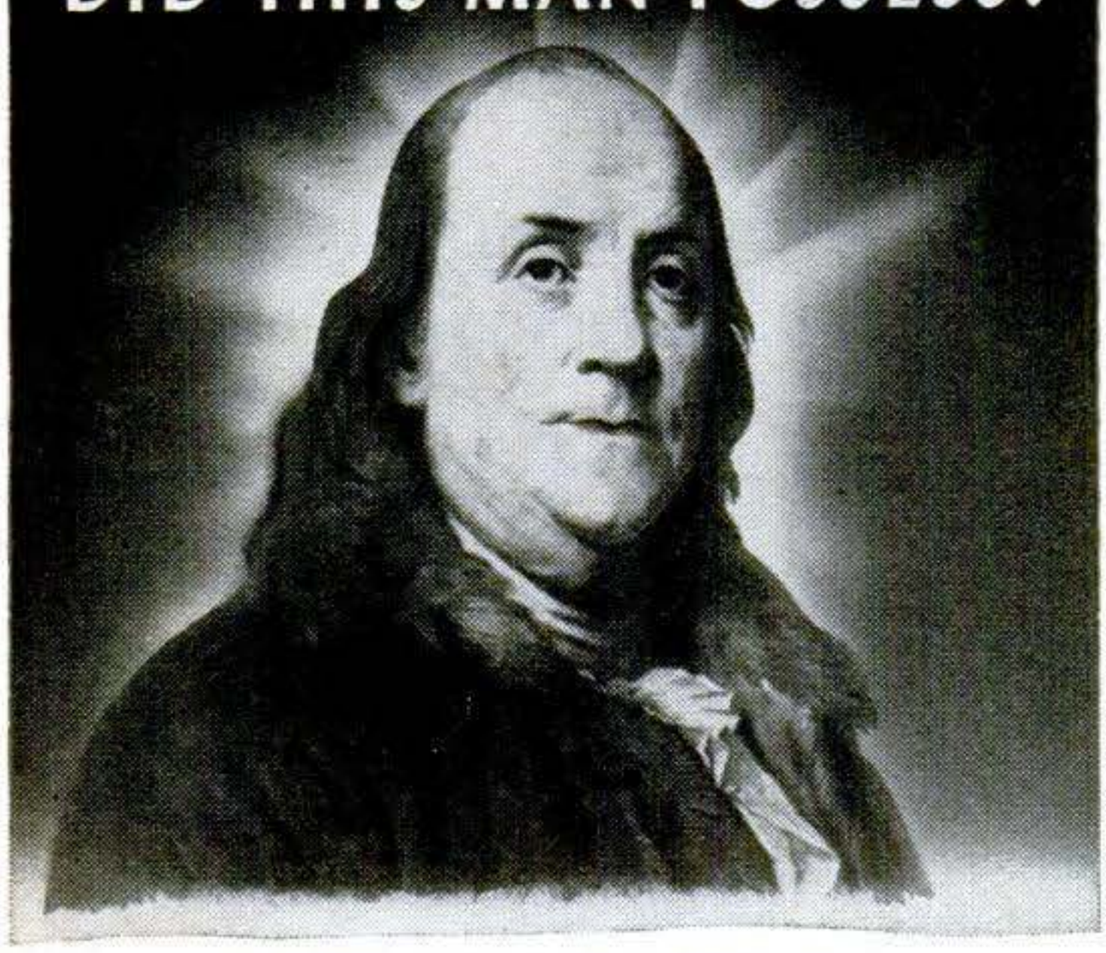
WHAT SECRET POWER DID THIS MAN POSSESS?



BENJAMIN FRANKLIN
(A Rosicrucian)

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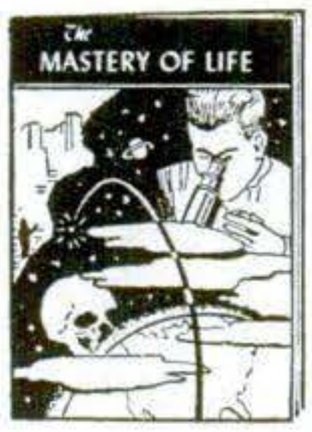

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Scribe T.L.M.
The ROSICRUCIANS (AMORC)
San Jose, California

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[May, p. 196] brought to mind the use of car engine mounts for quieting power tools. I have seen this scheme used in mounting a spin dryer that was causing considerable vibration. These mounts made the dryer operate without a whisper. I am sure suitable mounts can be found for power tools that would quiet them at very little cost.

RALPH E. NEWPORT

Amherst, Mass.

Back Issues of PS for GIs

Sir:

I'd like to volunteer to fill the request in your Letters department in June [p. 16] from S/Sgt. Henry A. Luke, stationed in Japan, for back issues of PS.

I have accumulated a great many, including some in the old large size of the early years. Sgt. Luke and his buddies at Yakota Air Force Base are welcome to any or all of them earlier than January 1949. This offer is open to any armed forces post

—but not to private individuals—that will provide transportation for them.

Don't misunderstand that I place no value on back issues—I do. But having also served in the Army, back in World War I days, I appreciate what a kick our boys get from magazines like yours.

FRANK D. MATLACK

252 Charles Ave.,
Port Richmond,
Staten Island 2, N.Y.

Another Tip on Used Cars

Sir:

You omitted one very important bit of advice from your article on selecting a used car [April, p. 188]. This is to check around the bottom of the doors and body for rusted-out places.

HENRY GRAF

Lancaster, Ohio

Badly rusted body metal is a good reason for

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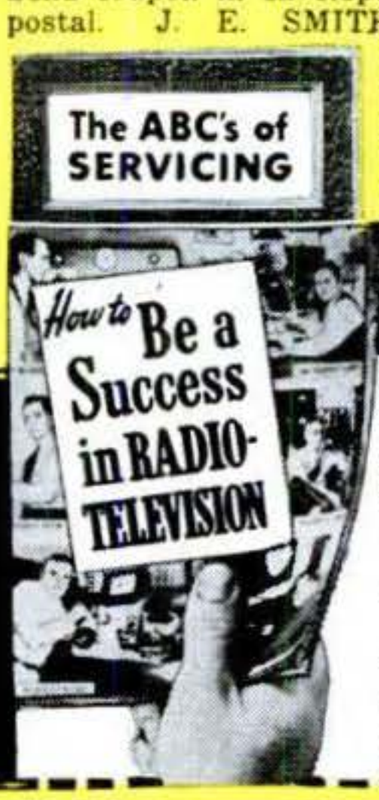

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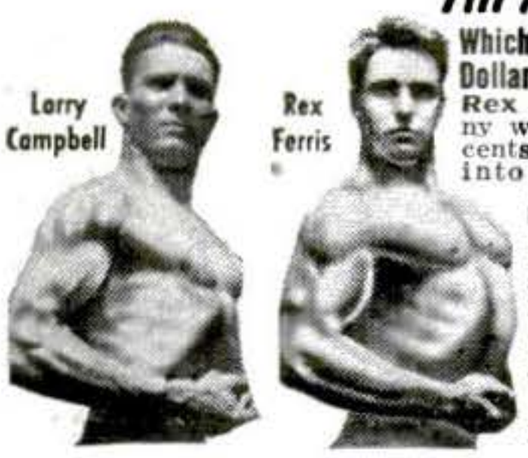

Which One Paid Hundreds Of Dollars To Train At My Side? Rex Ferris, was a skinny weakling, paid a few cents to start building into a Champion All Around He Man! Larry Campbell paid me hundreds of dollars to train at my side years ago. Start to become an All-Around He Man at home with these same secrets for only a few cents—like Rex Ferris did!

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rejecting a car. But if the corrosion is not too bad, repairs are inexpensive.

No More Kurtis Kits

Sir:

Although the Kurtis-Kraft sports car described in your May issue, p. 136, has been in production for some time, your article told me a lot about it that I had never seen in print before. In fact, I always appreciate the way your articles say so much in so little space. But I want to call your attention to one slip in this one: The car is no longer available in build-it-yourself kits, but only as a production-line job.

F. THOMPSON HENKEL
Bloomfield Hills, Mich.

You are quite right. Kurtis abandoned kits between the time our article was written and the time it appeared in print.

How Tractor Clutch Works

Sir:

On page 211 of your May issue is a sketch showing the power train and clutch linkage for a midget tractor. Would you please explain how this clutch works, since the 10-tooth sprocket seems to be hooked to the engine shaft. The way I see it, then, the clutch isn't doing any good behind the main drive.

J. D. WILSON
Morristown, Tenn.

In this type of motor-scooter clutch, driving and driven members are coaxial—that is, power from the engine runs through a small central shaft to the clutch, then back through a rotating sleeve around the shaft. The 10-tooth sprocket is on the sleeve, not the inner shaft.

Oops!

Sir:

The cutaway view on page 101 of your June issue, in the article "Will We Drive Turbo Cars?", shows the centrifugal compressor revolving at 36,000 r.p.m. while the compressor turbine revolves at only 22,650 r.p.m. . . . I can find no break in the shaft . . .

PFC DALE W. HALL
Chanute Air Force Base, Ill.

There soon would be one! In labeling the

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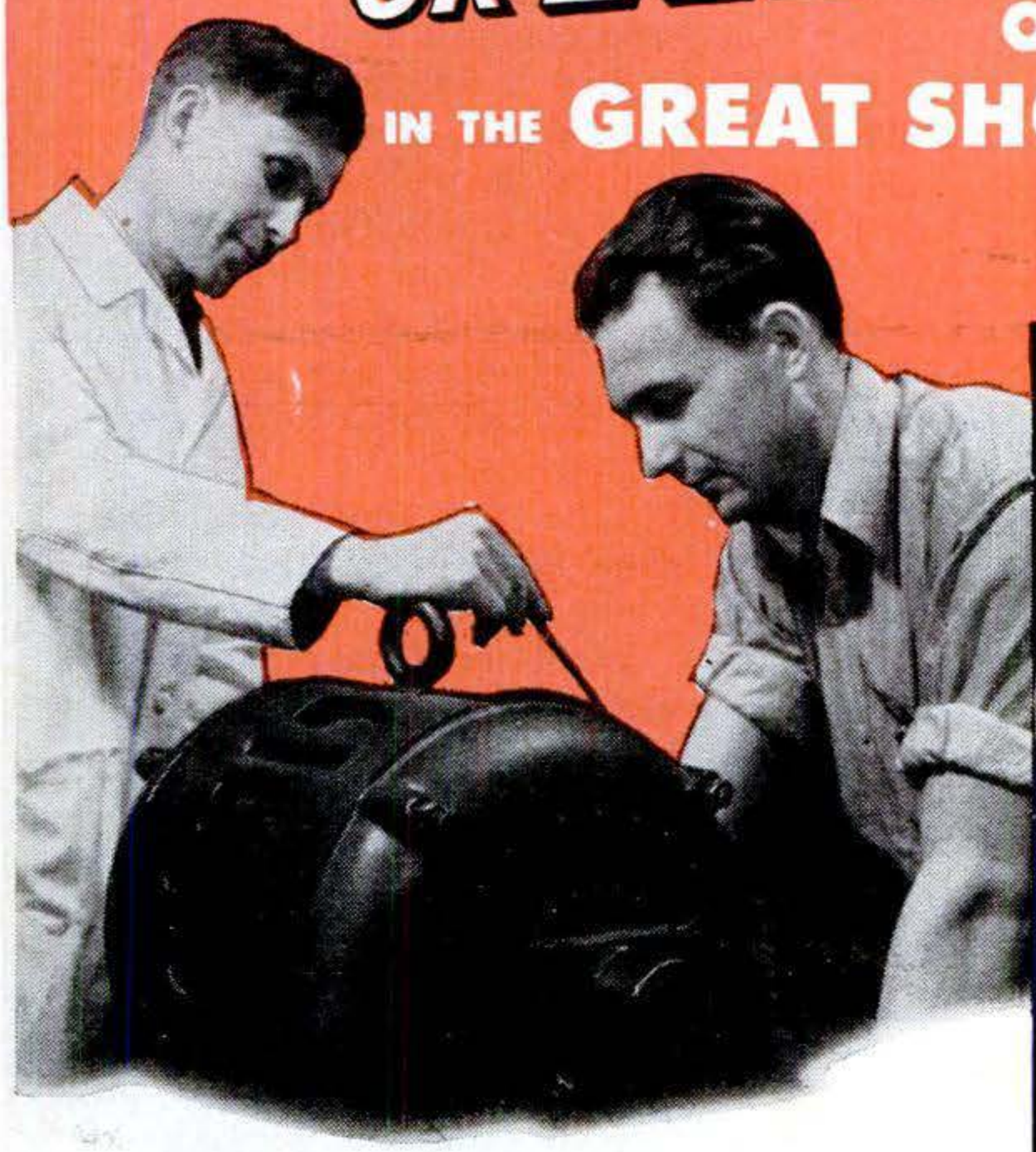

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drawing, the 22,650 r.p.m. figure for the power-turbine was misapplied to the compressor turbine also. Being on the same shaft, compressor and compressor turbine rotate at the same speed—36,000 r.p.m.

Three-Minute Quiz

Sir:

Your June issue contains so much brain-stirring material that it will take me many hours of study to digest even part of it. How you get all of it within the covers seems just short of a miracle. On six points, however, I need a little help:

1. Page 140: What does M.G. stand for?
2. Page 141: If left-drive cars are available, why do you distract American readers with the English type?
3. Page 163: The retaining wall at the cinder-block home has no apparent weep holes. Are they not desirable?
4. Page 173: What about the paint burning off a coffee can used for baking a potato—won't it smell?
5. Page 174: Looks like that electric fan, placed under a wire basket to keep children's fingers out, should be secured to the board before the basket is.
6. Page 280: When thinking machines are built with a conscience, will there be crime among them as among men?

NOBLE E. PEELER

St. Paul, Minn.

1. The initials M.G. stand for Morris Garage, original name of the car's manufacturer, now known as the Nuffield Organization. In 1923, W. R. Morris—now Lord Nuffield—souped up several standard Morris Oxfords for use as racing cars. The design became popular, and the cars became a standard line under the name M.G.

2. Left-hand drives on the M.G. midget are available only on special order. At the time our photos of it were taken, the only new M.G.s in this country were all equipped with British right-hand drive.

3. The blocks in the wall were laid up dry—no mortar—so there is plenty of space between them for water to drain through.

4. First time the can is used the paint will smell.

5. The fan need not be secured to the board—any more than it needs to be screwed down on a table. Blades can't hit the basket, anyway, since the fan has a guard.

6. No comment.

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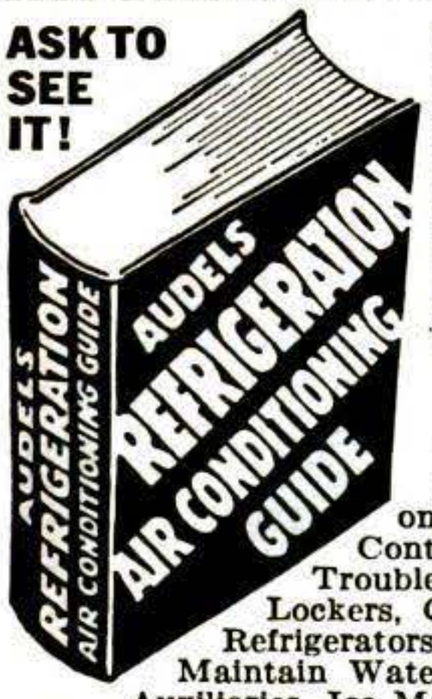

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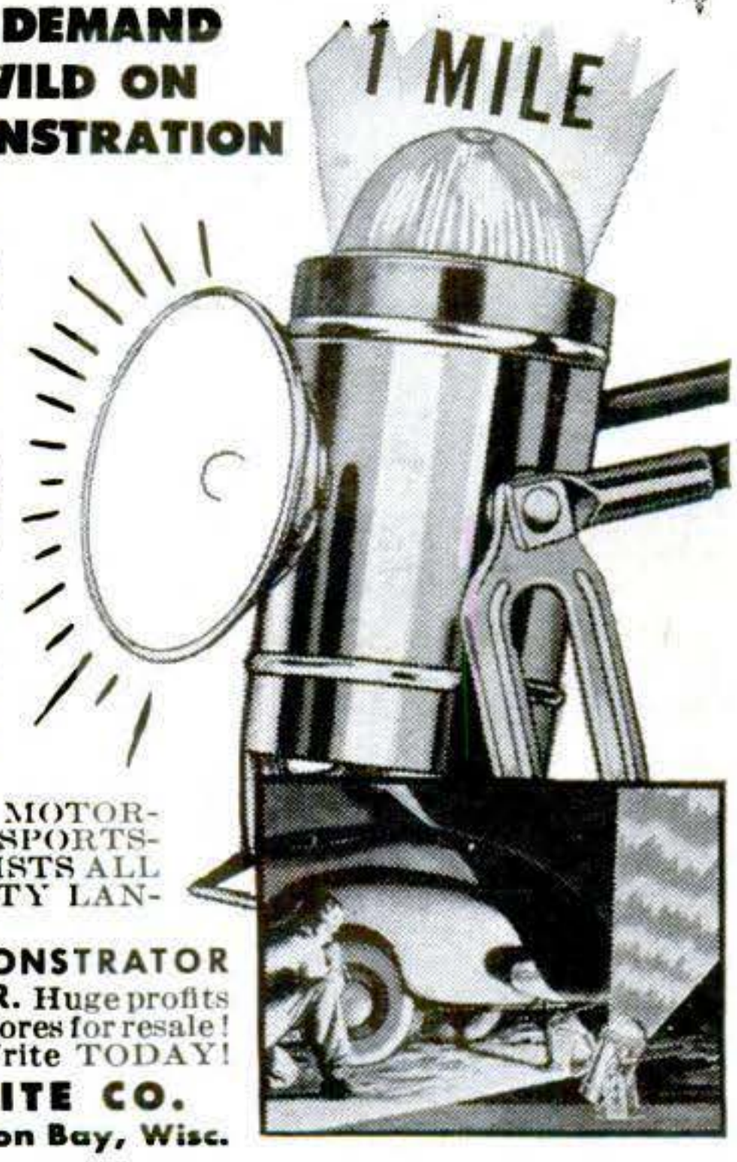

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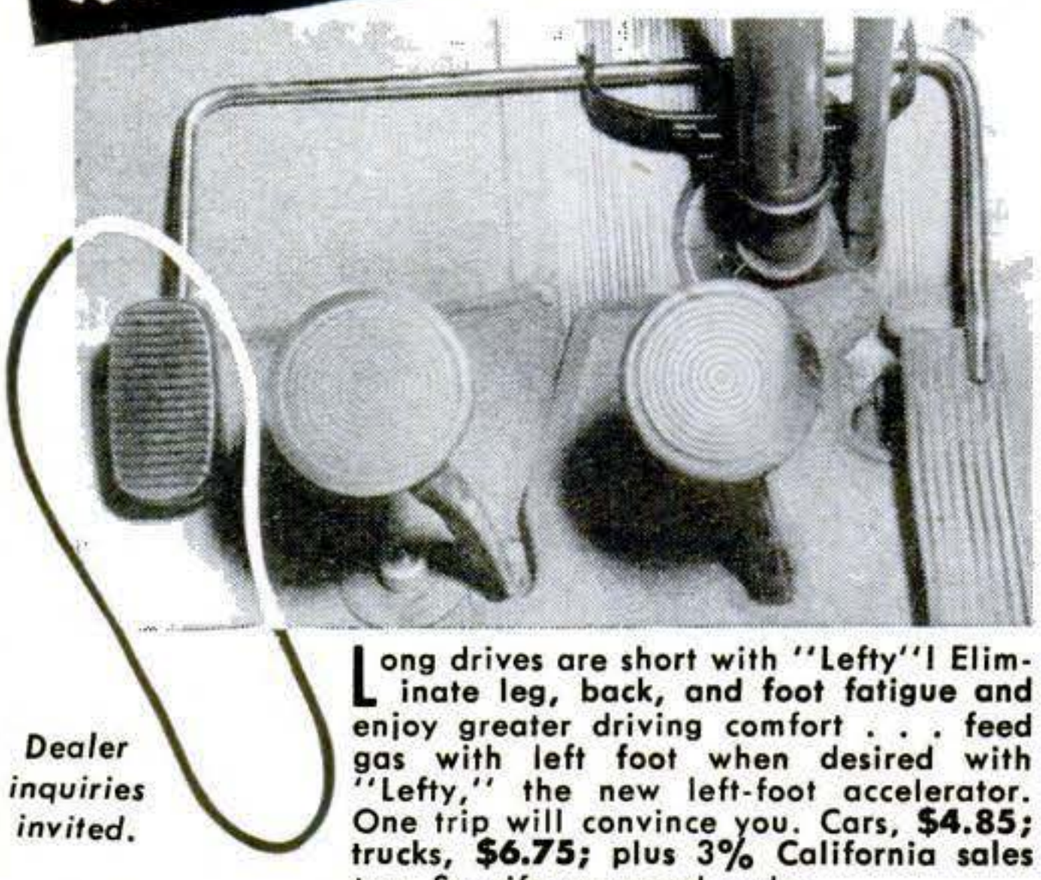

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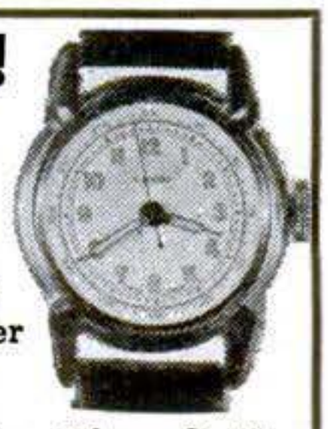

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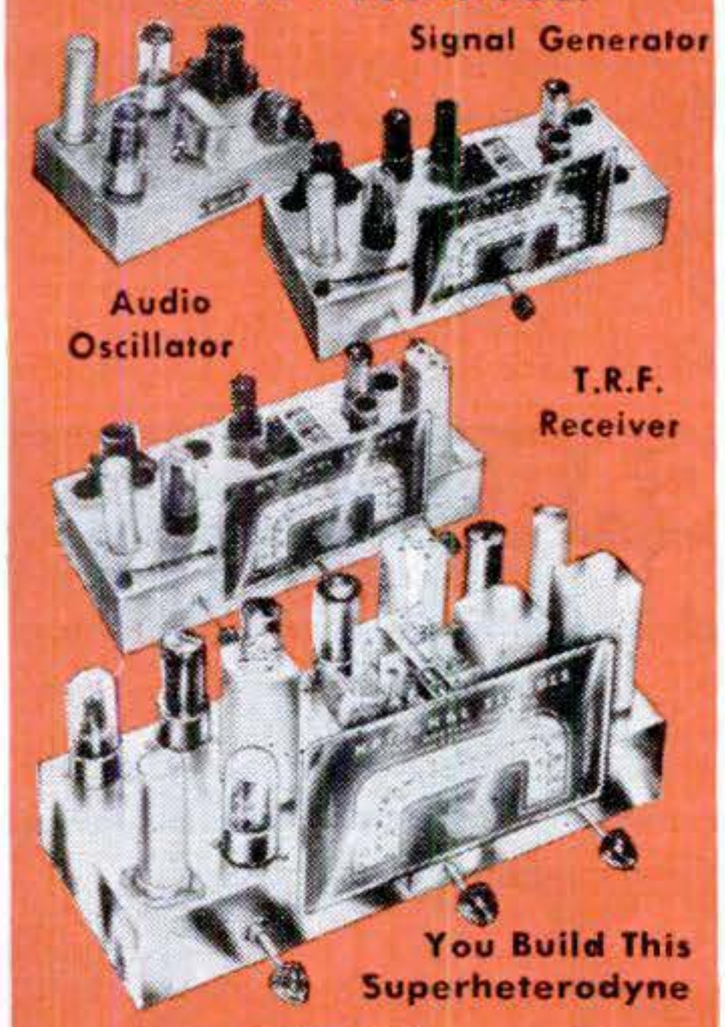

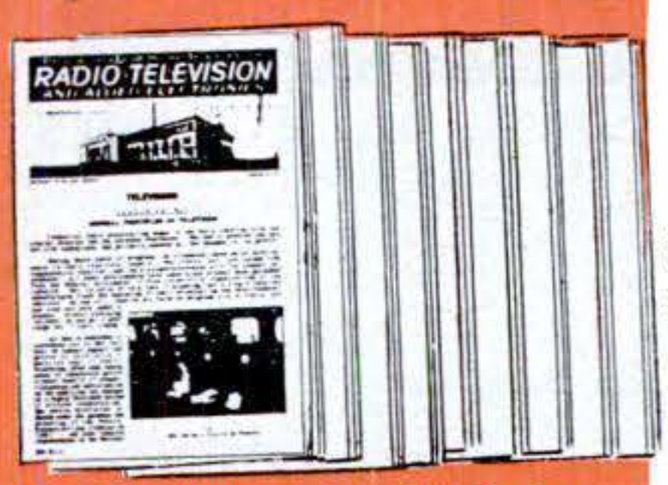

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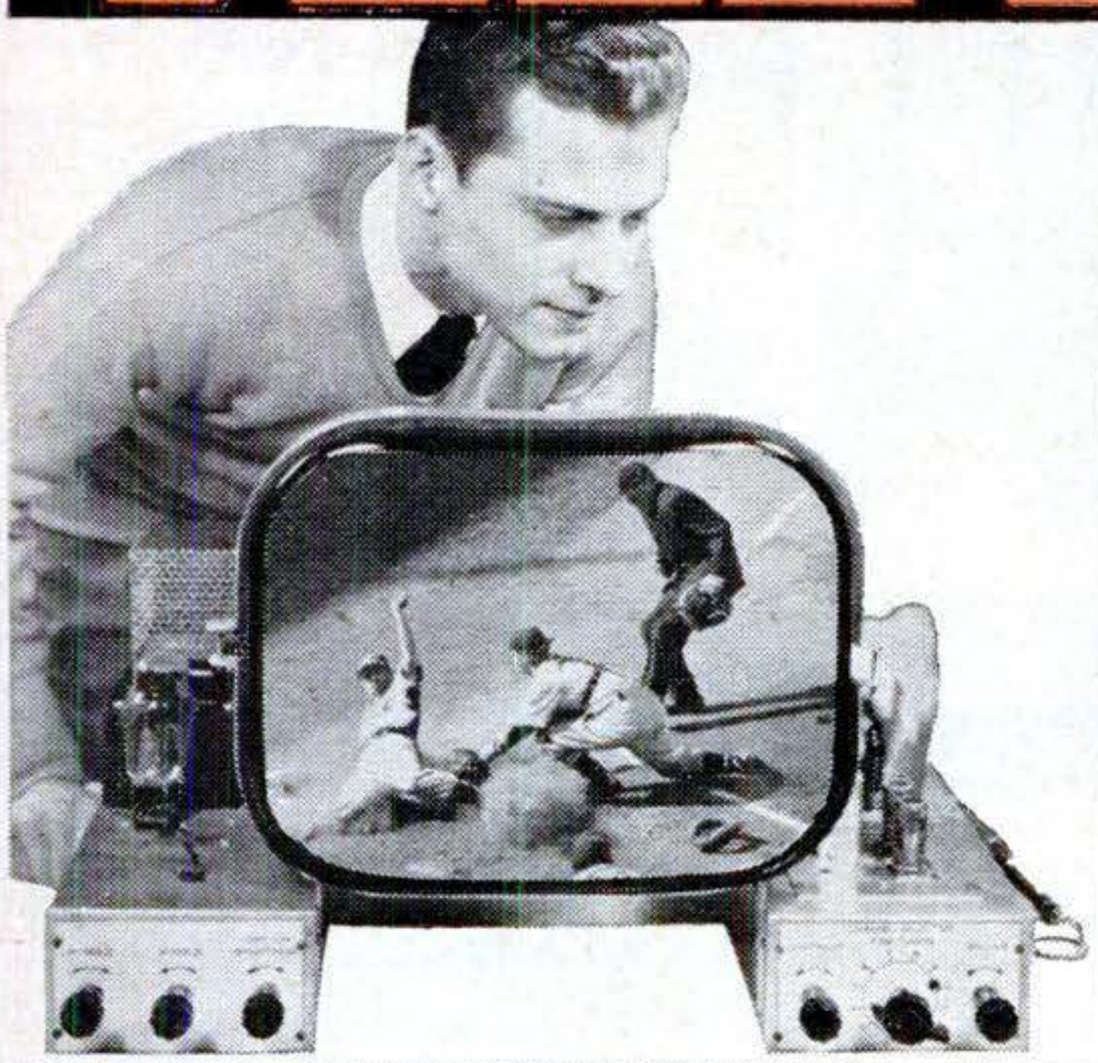

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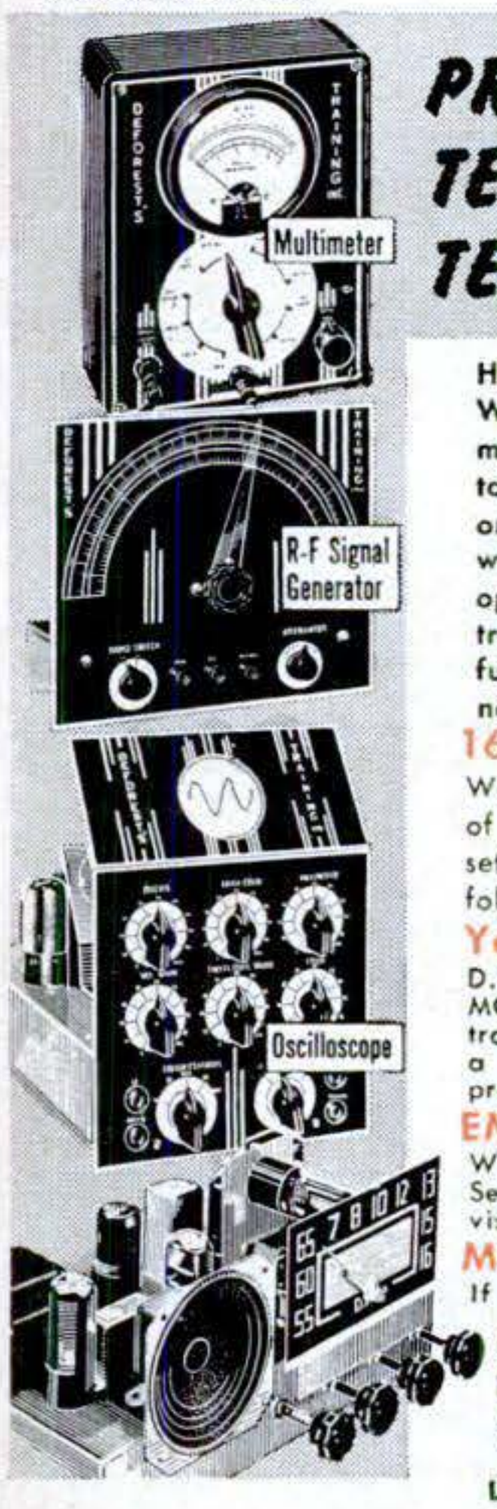

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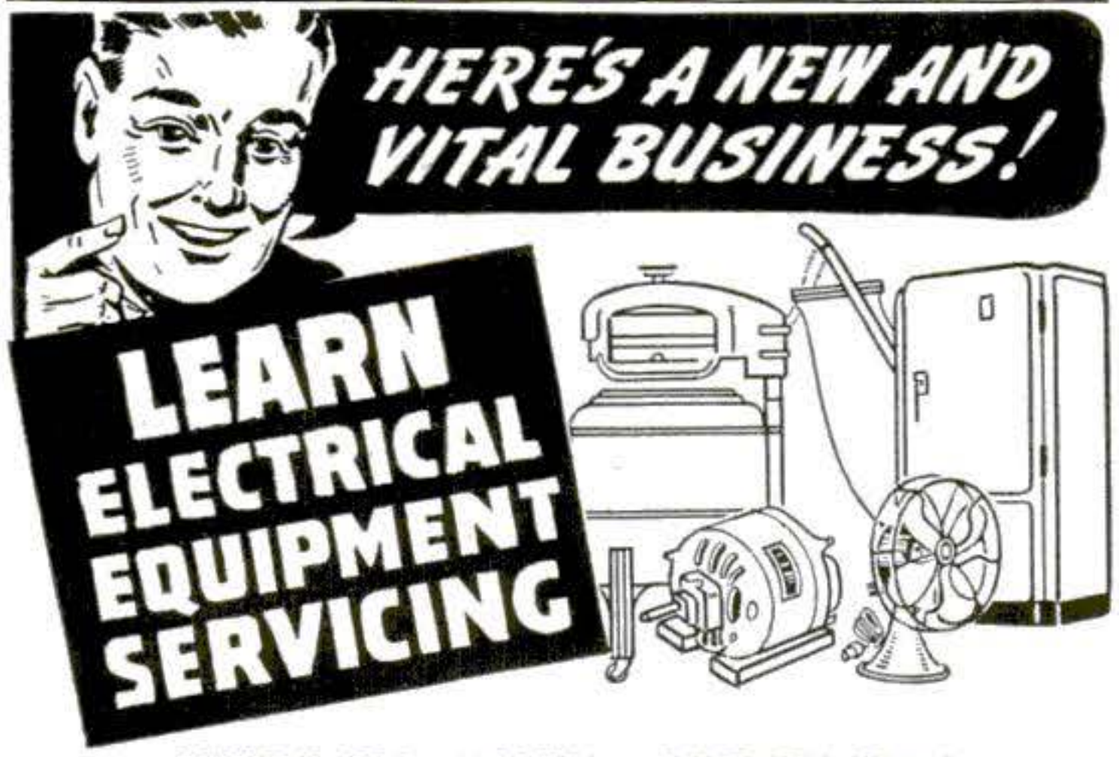

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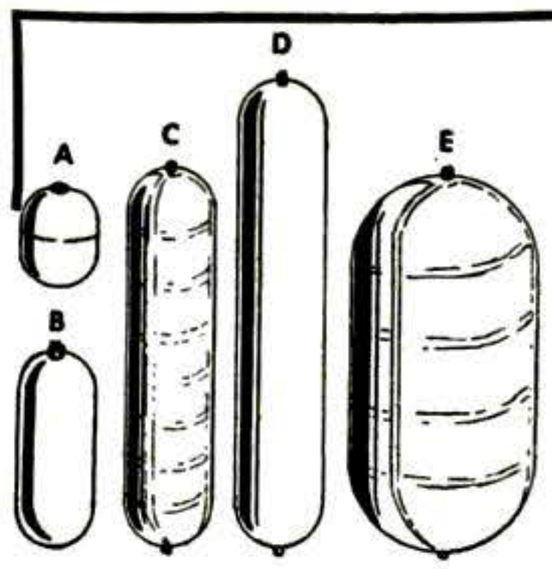

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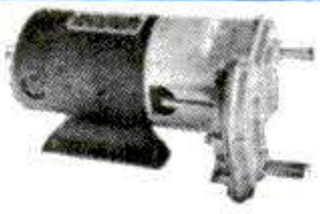

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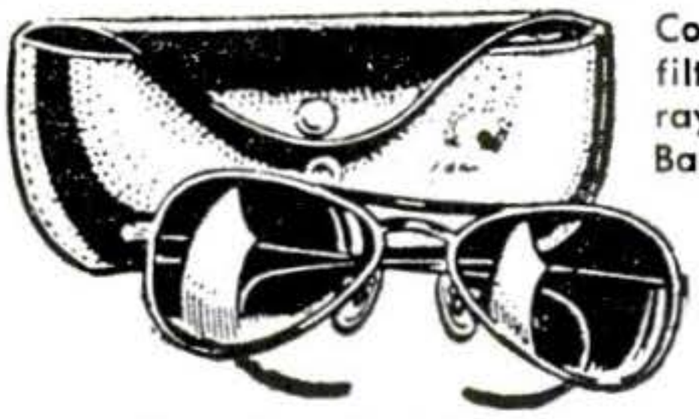

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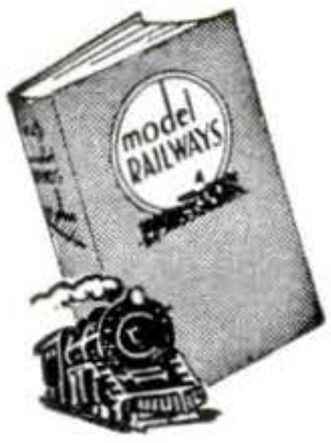

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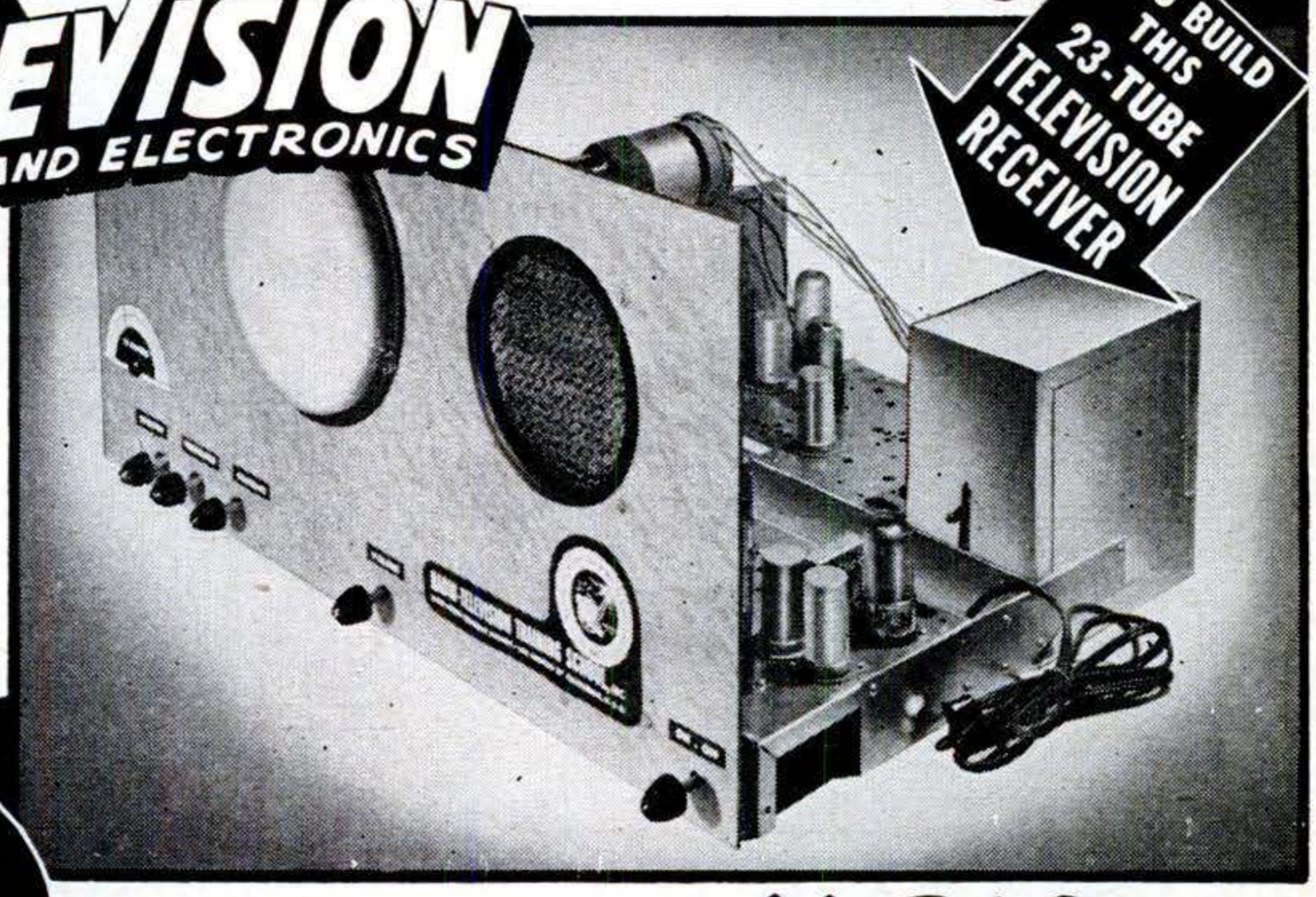

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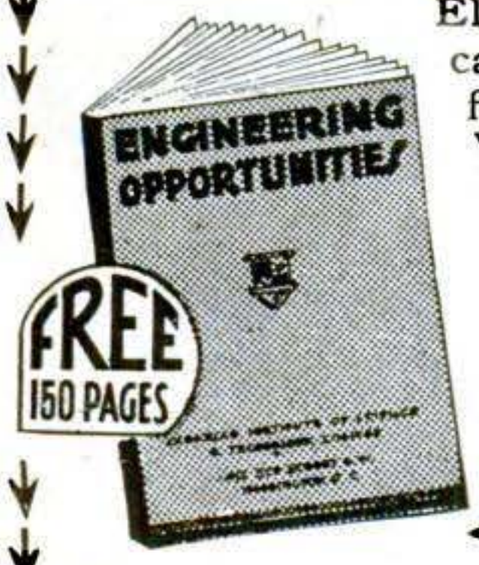

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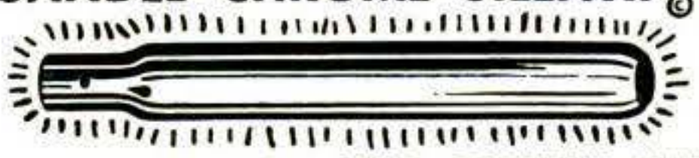

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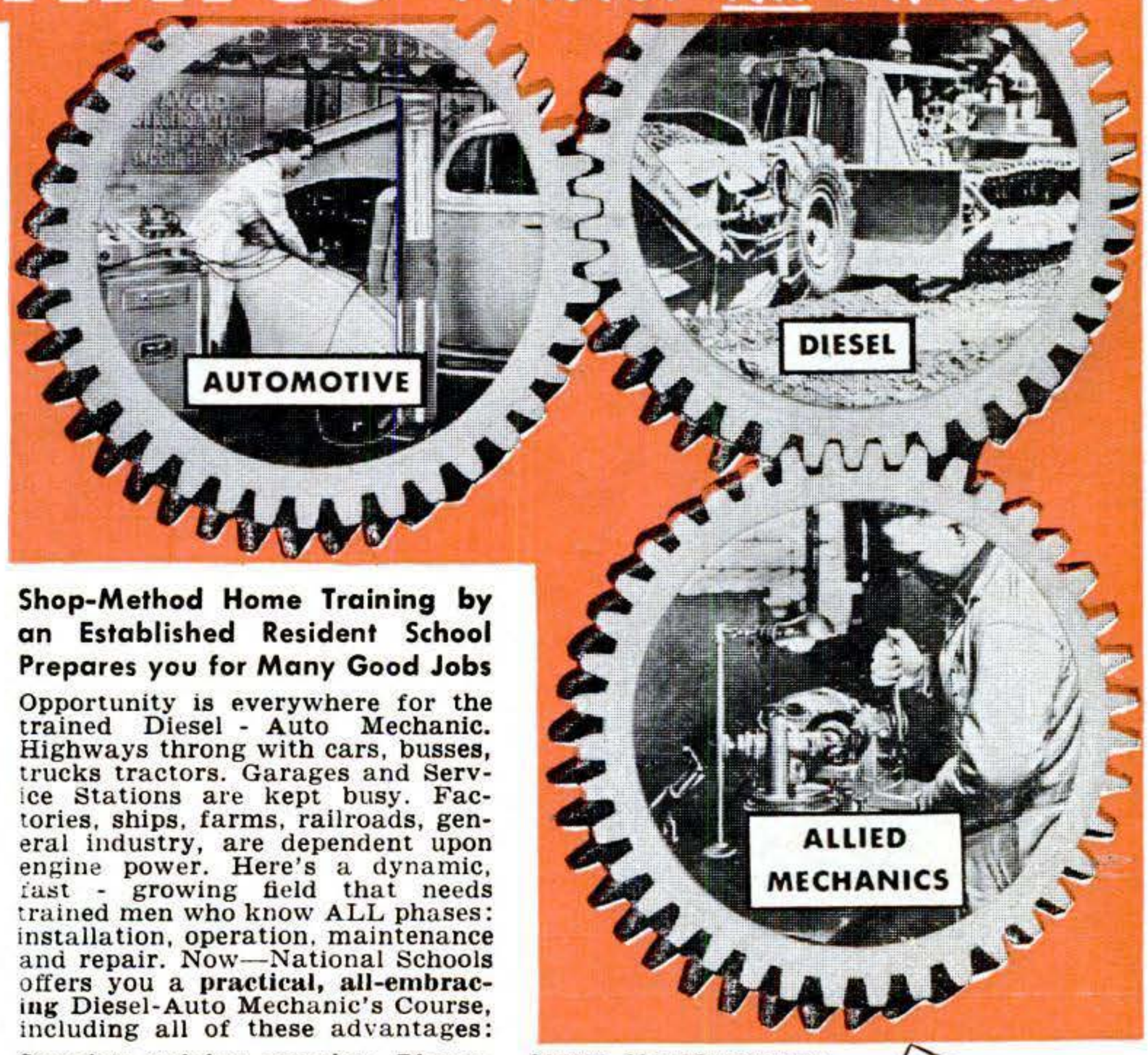

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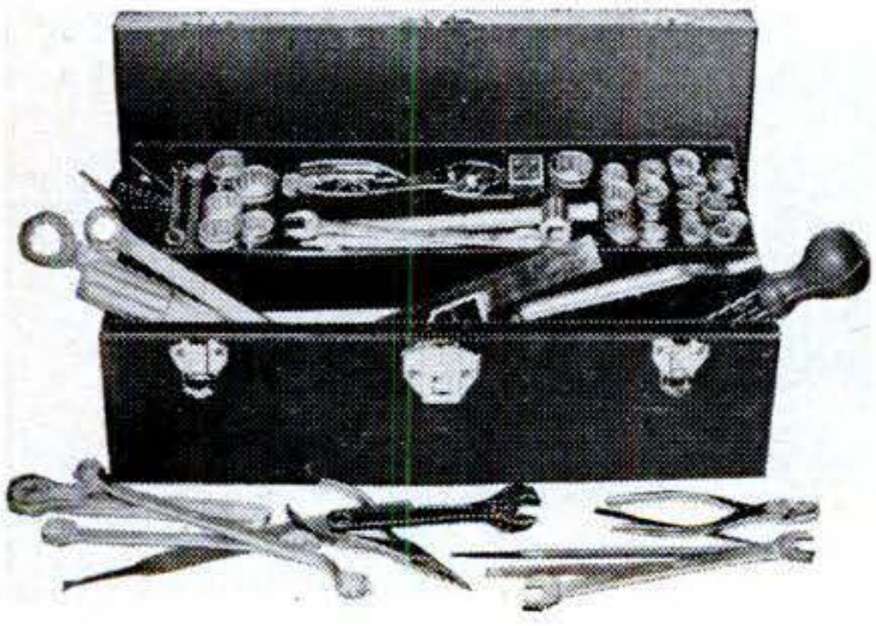

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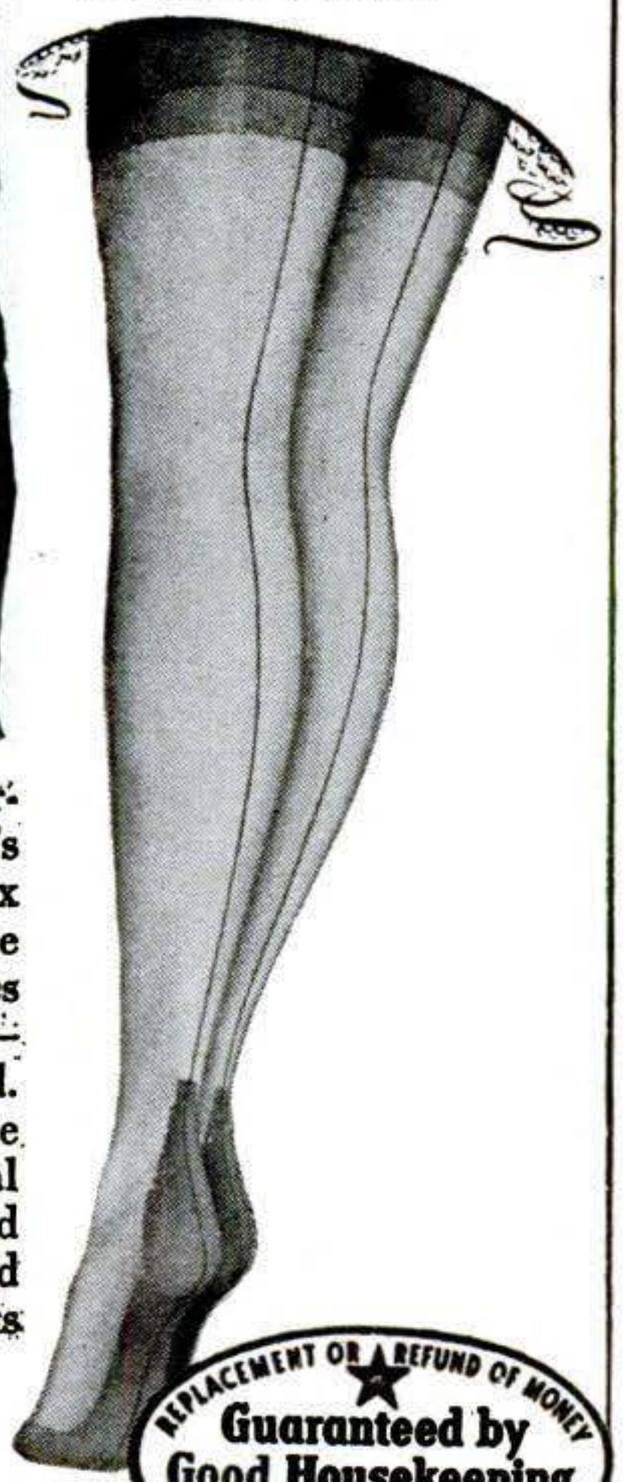

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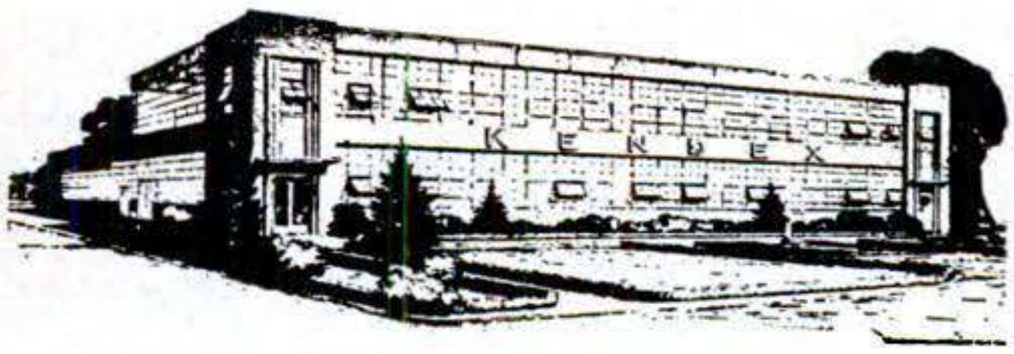

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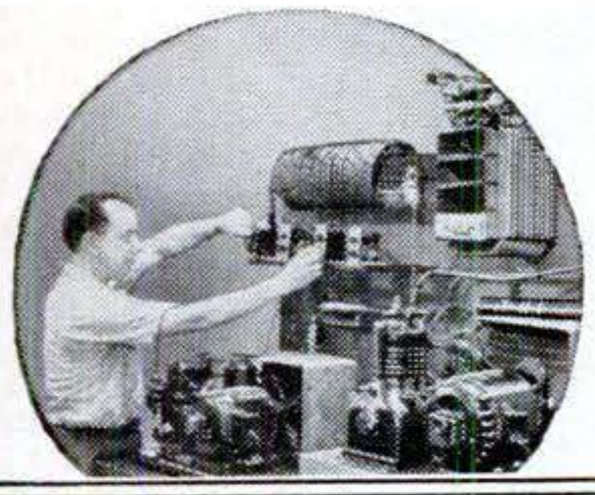

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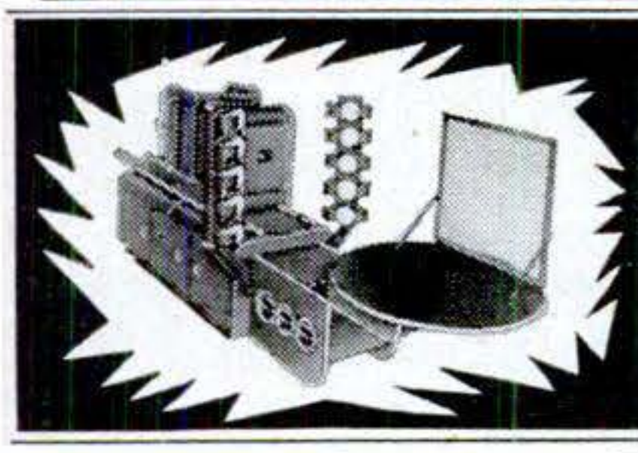

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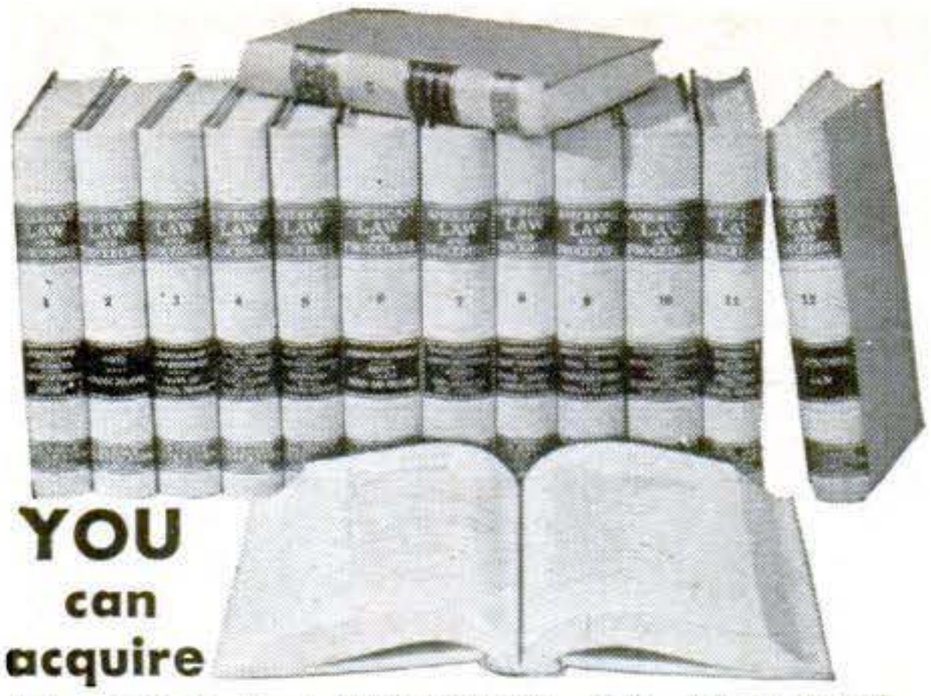

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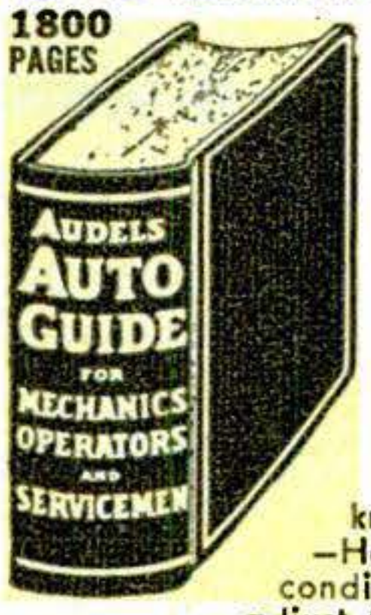

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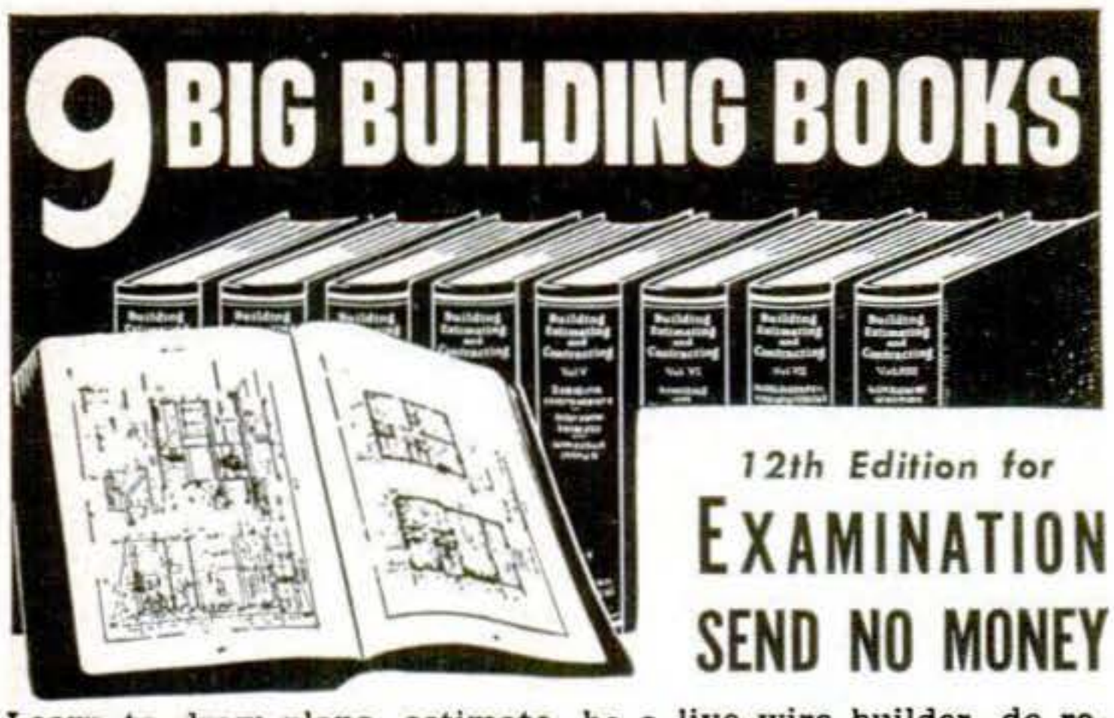

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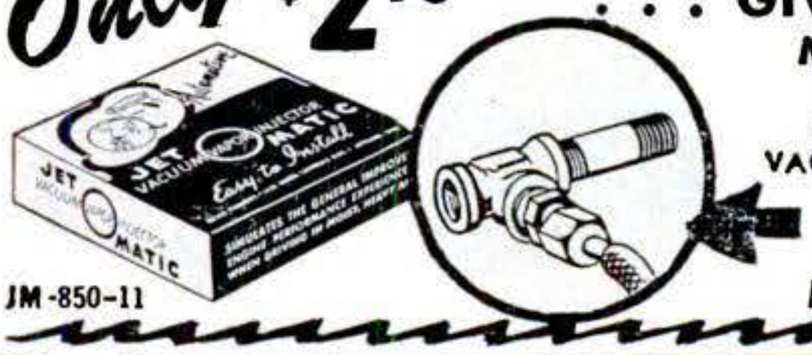

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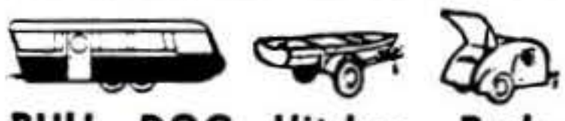

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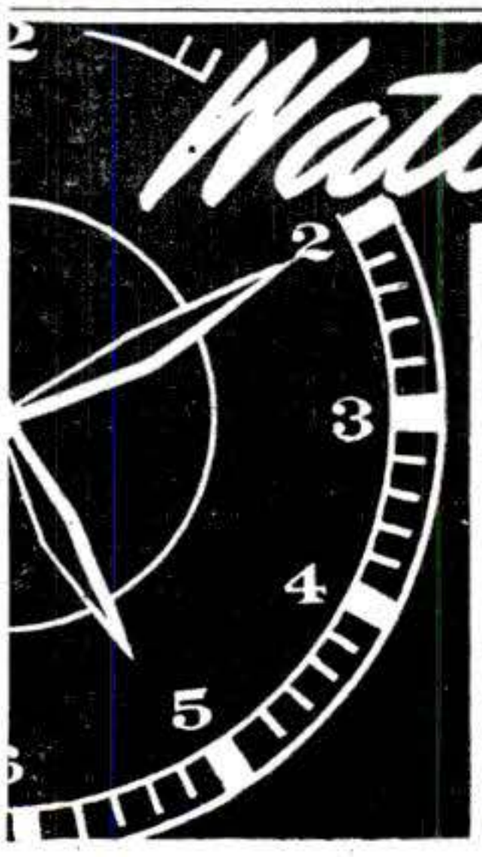

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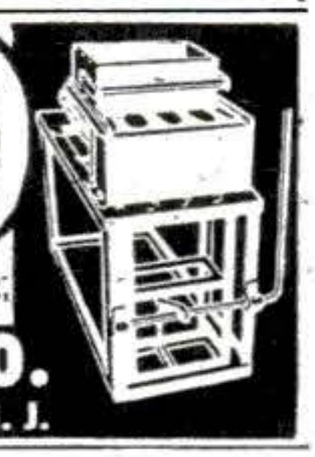

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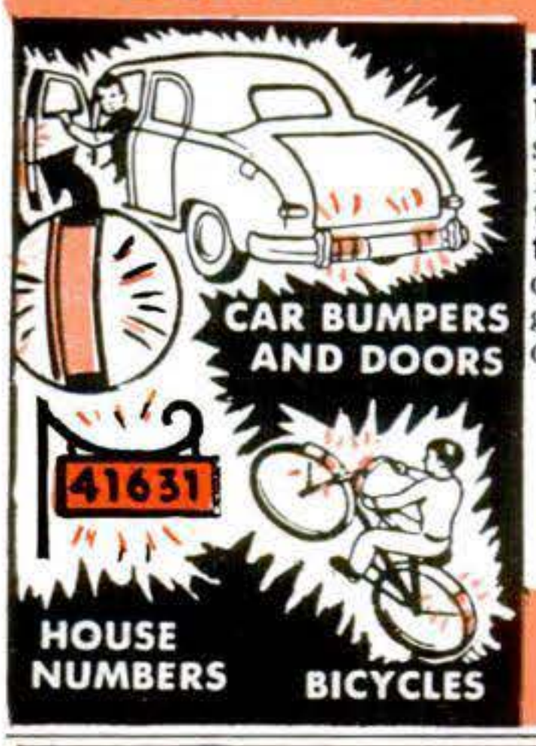

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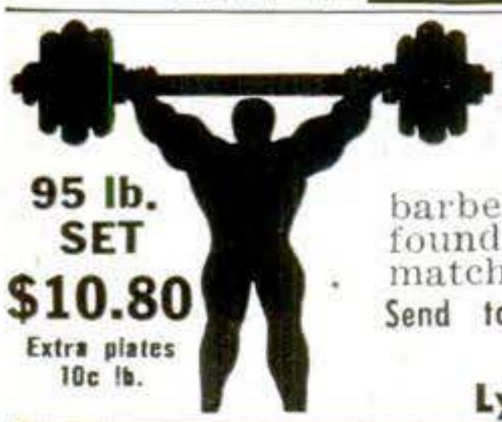

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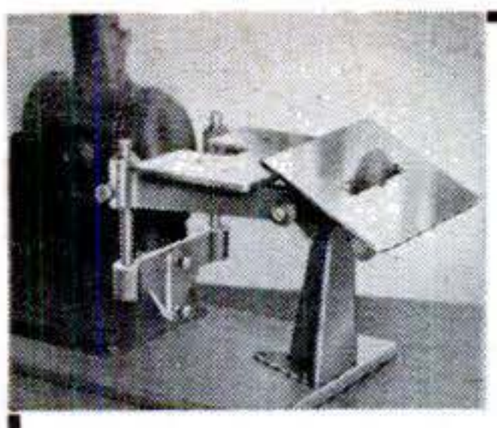

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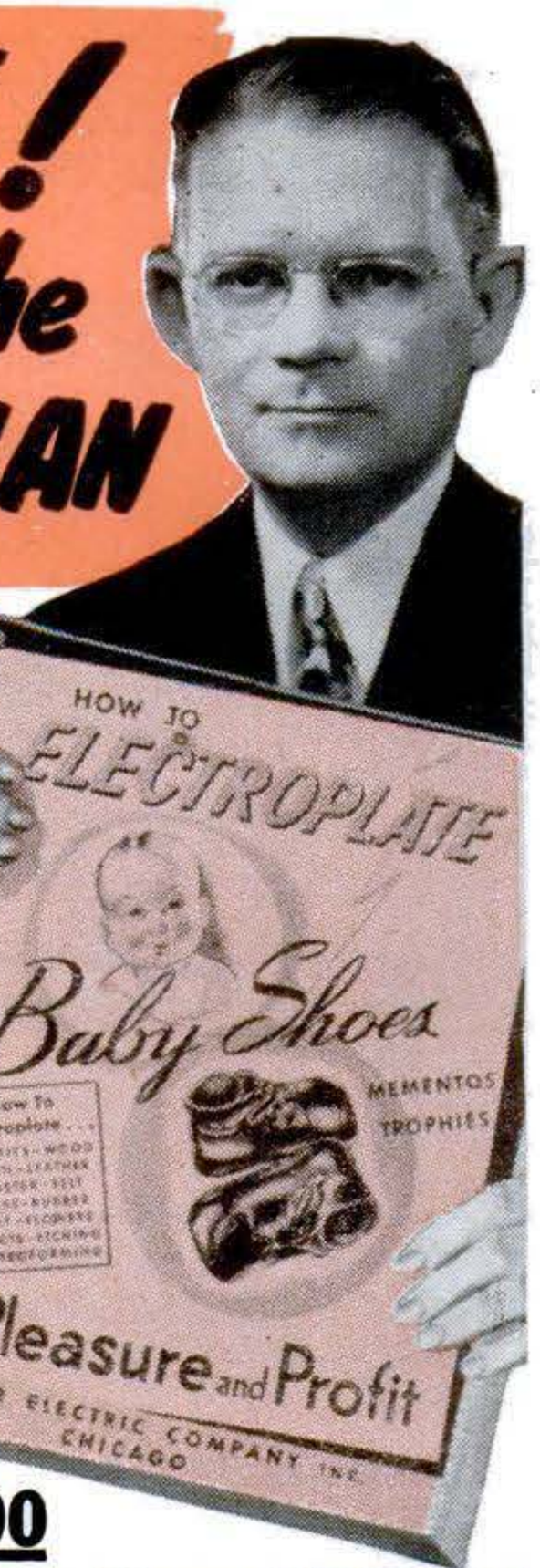

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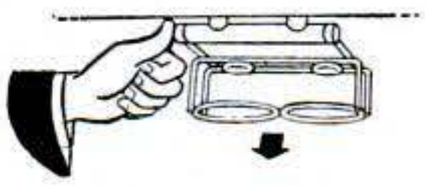

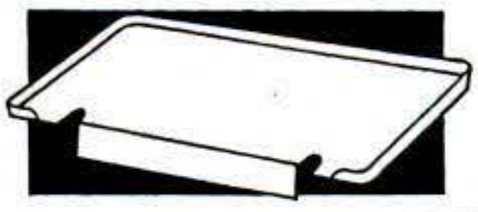

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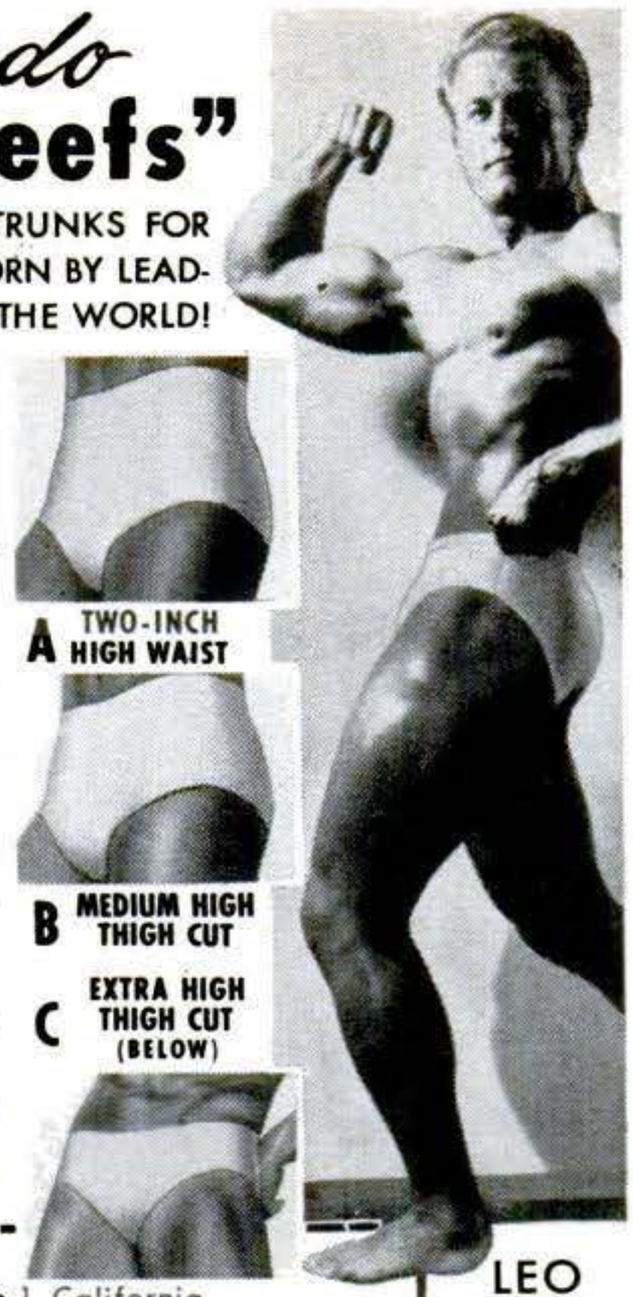

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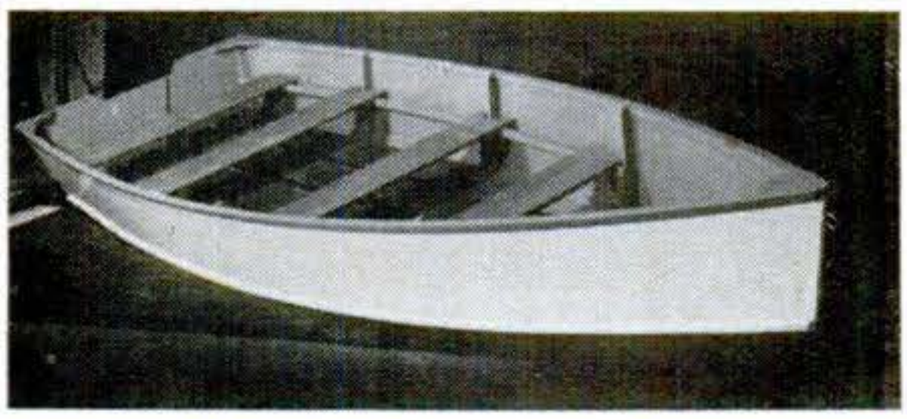

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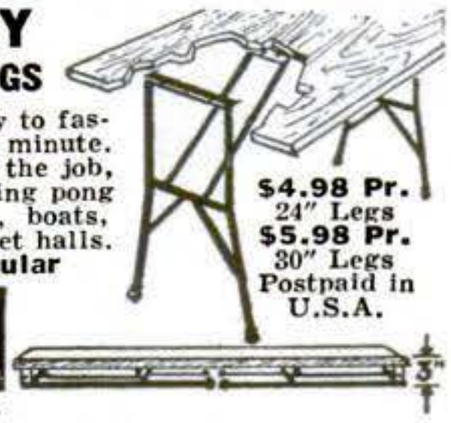

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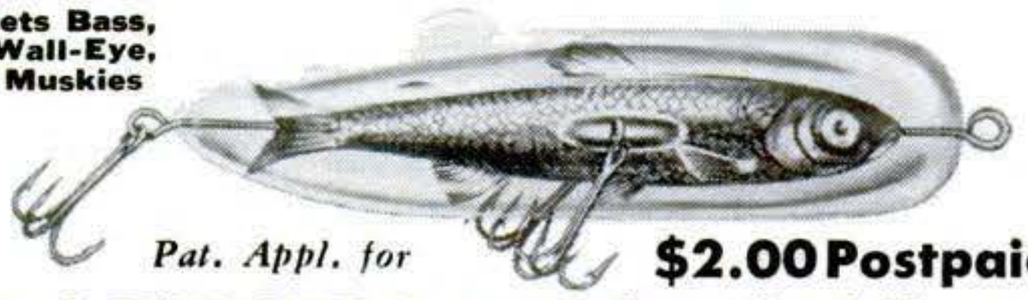

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By ROD RODRIGUEZ
Auto Editor

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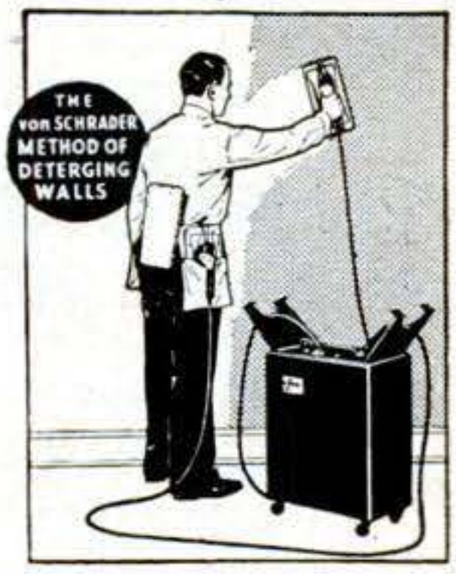

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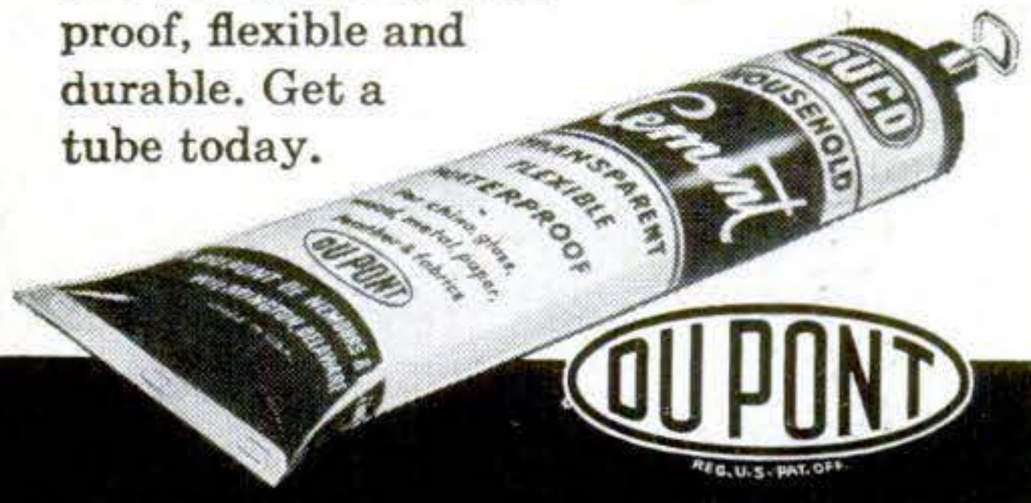

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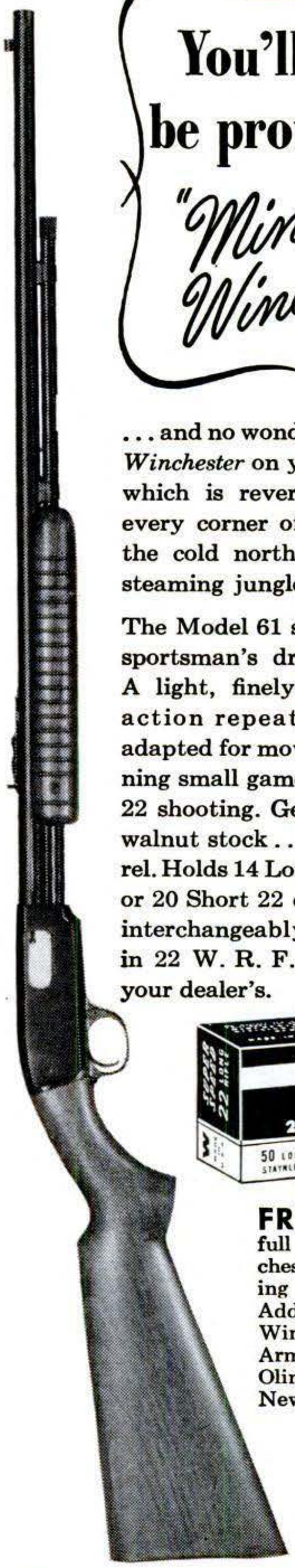

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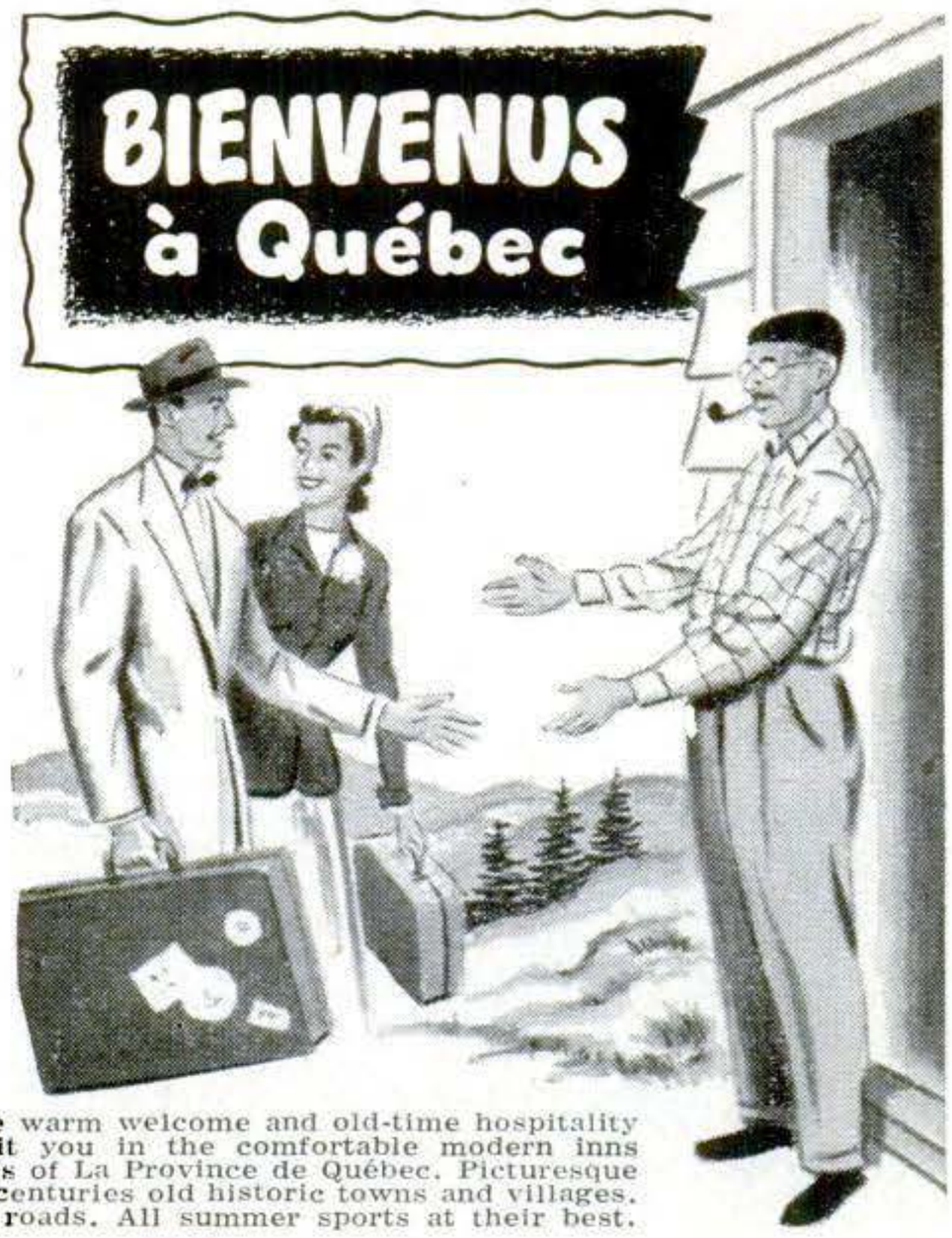

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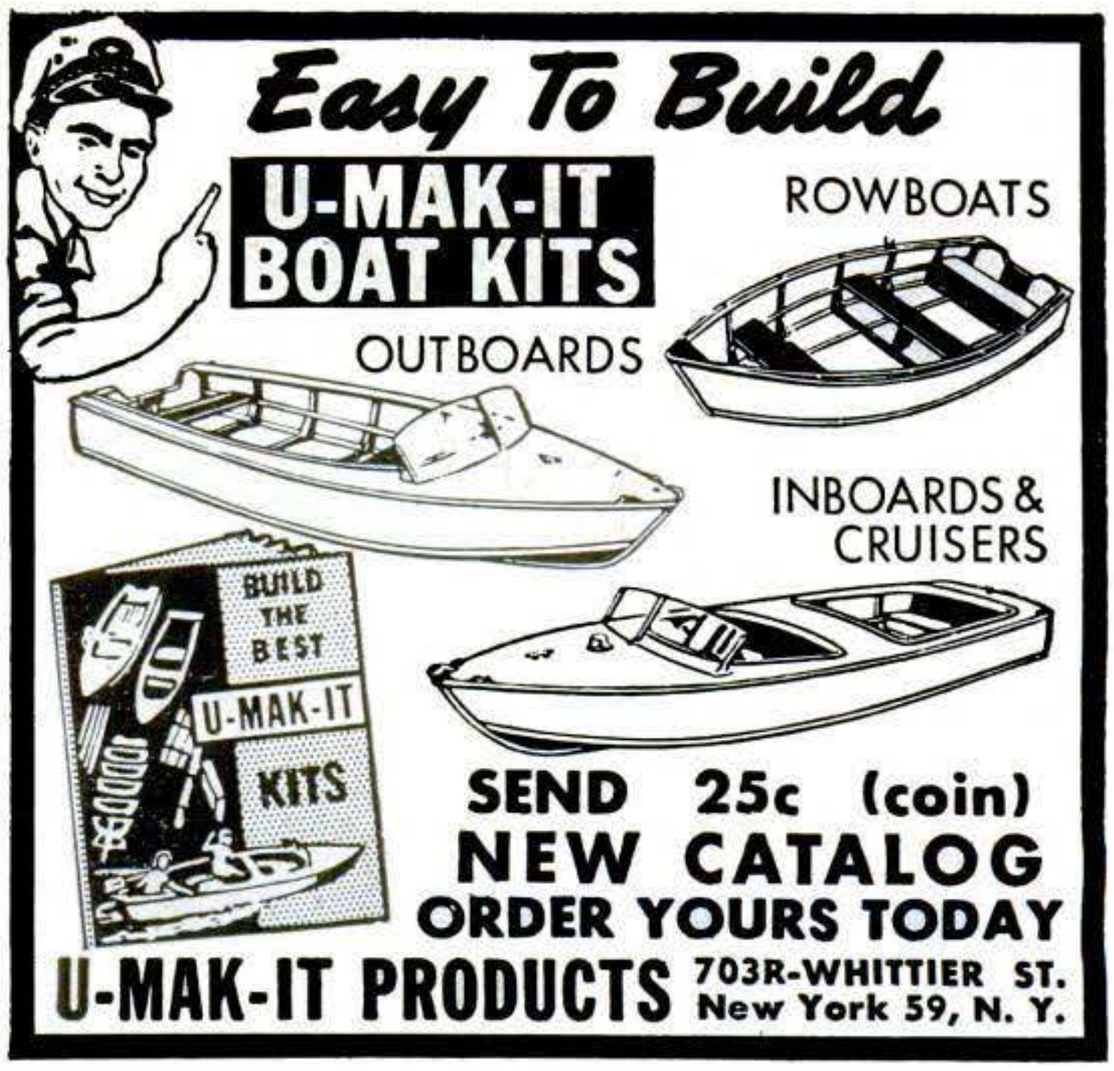

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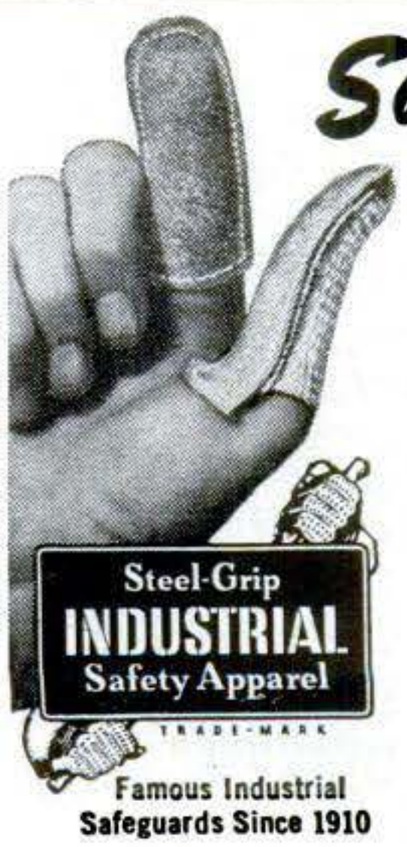

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20	4.00	5.00	3.25	4.00	½, ⅝, ¾
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Write for pamphlet on larger fan blades, wire guards, fan bases, shutters, pillow blocks, exhaust fan frames, etc. Shipped prepaid if money accompanies order. Dealers write for discount.

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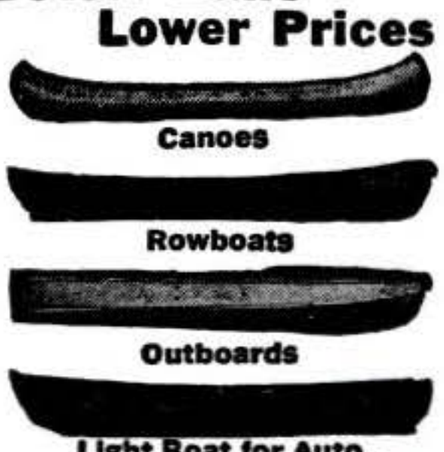

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New RCA electron tube "freezes" movements that occur, and are ended, in millionths of a second!

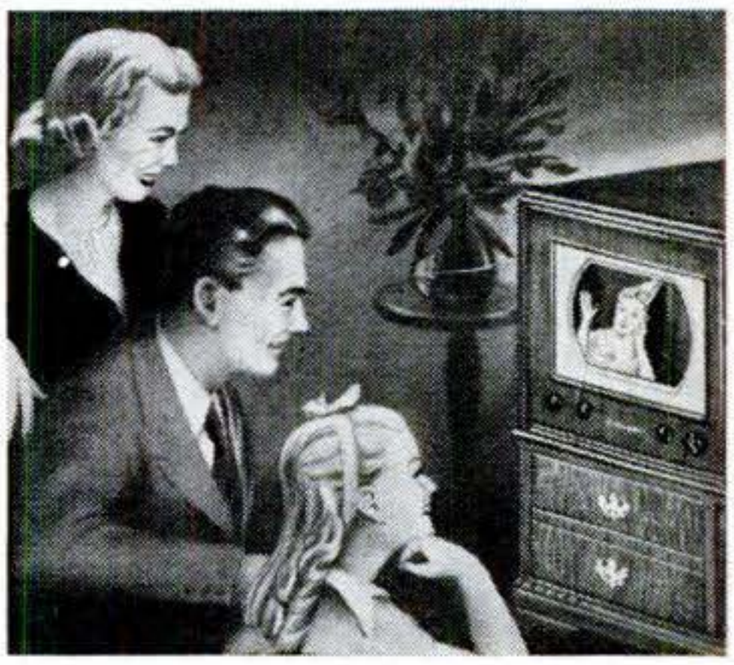
How to "see" a super fine slice of time!

Now scientists at RCA Laboratories work with slivers of time too infinitesimal for most of us to imagine. Their new electron tube, the Graphechon, makes it possible.

For instance, in atomic research, a burst of nuclear energy may flare up and vanish in a *hundred-millionth* of a second. The Graphechon tube oscillograph takes the pattern from an electronic circuit, and recreates it in an image which can last for a minute and a half. Scientists may then observe the pattern of the burst . . . measure its energy and duration.

With Graphechon we can now watch fleeting phenomena which occur at random, outside our control. It is not only applied to nuclear research, but also to studies of electrical current . . . or in new uses of radar and television. Like so many products of RCA research, Graphechon widens man's horizons.

See the latest wonders of radio, television, and electronics in action at RCA Exhibition Hall, 36 West 49th St., N. Y. Admission is free. Radio Corporation of America, Radio City, N. Y. 20.



Progressive research, like that which gave us the Graphechon tube, accounts for the superiority of RCA Victor's new 1950 home television receivers.

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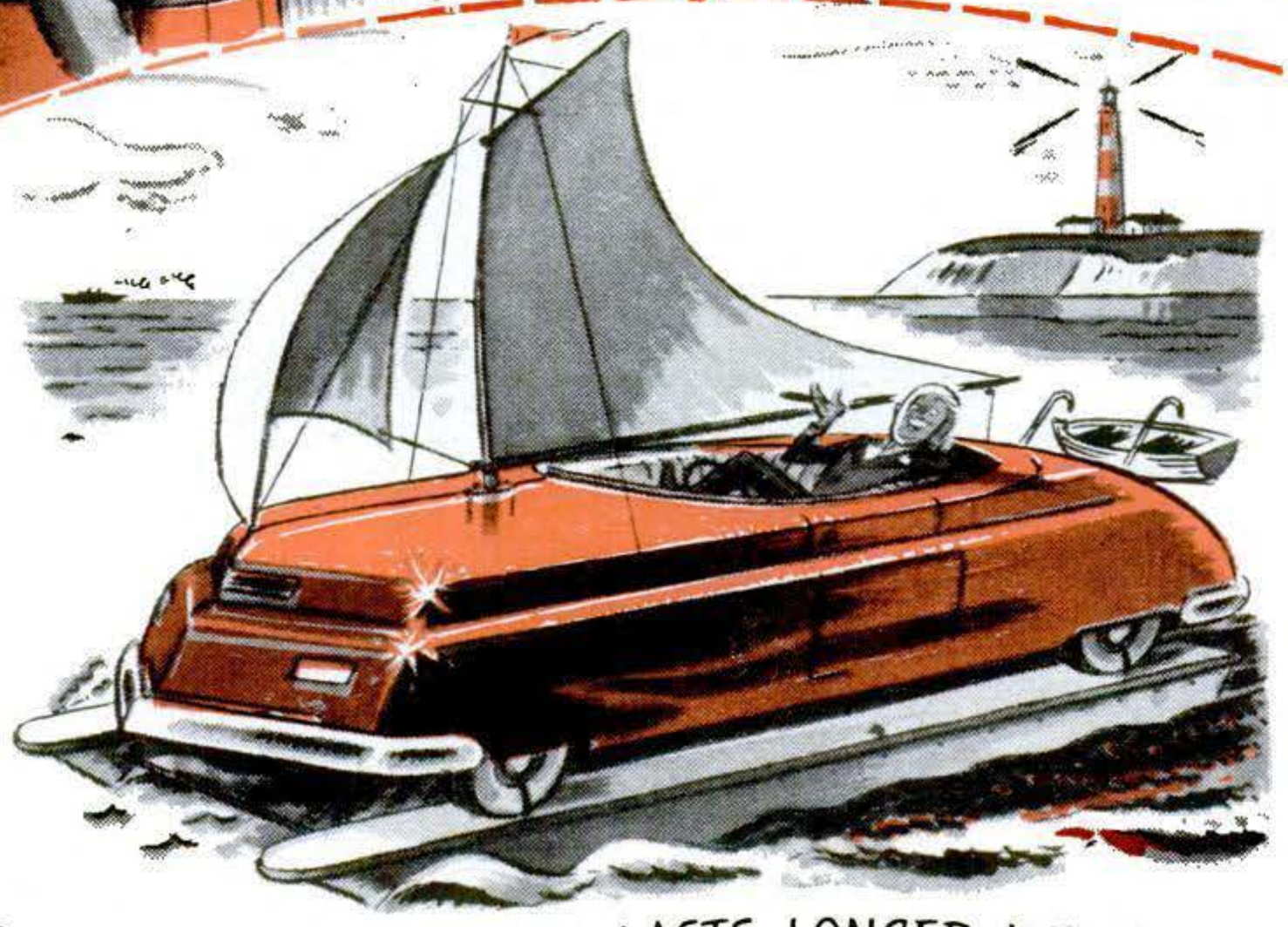
IF YOUR CAR FEELS LIKE THIS ...IT'S TIME FOR MARFAK CHASSIS LUBRICATION



THAT CUSHIONY FEELING LASTS LONGER WITH **MARFAK!**

Want summer driving that's *smooth* pleasure? Get longer-lasting *Marfak* lubrication! Tough, clingy *Marfak* sticks to its job — protecting chassis wear points and bearings for a thousand miles and *more.* Resists squeeze-out and wash-out, stands up to road poundings. You've got the proof in that swell "cushiony" driving ease that lasts! Get *Marfak* lubrication today from your neighborhood Texaco Dealer, *the best friend your car ever had.*

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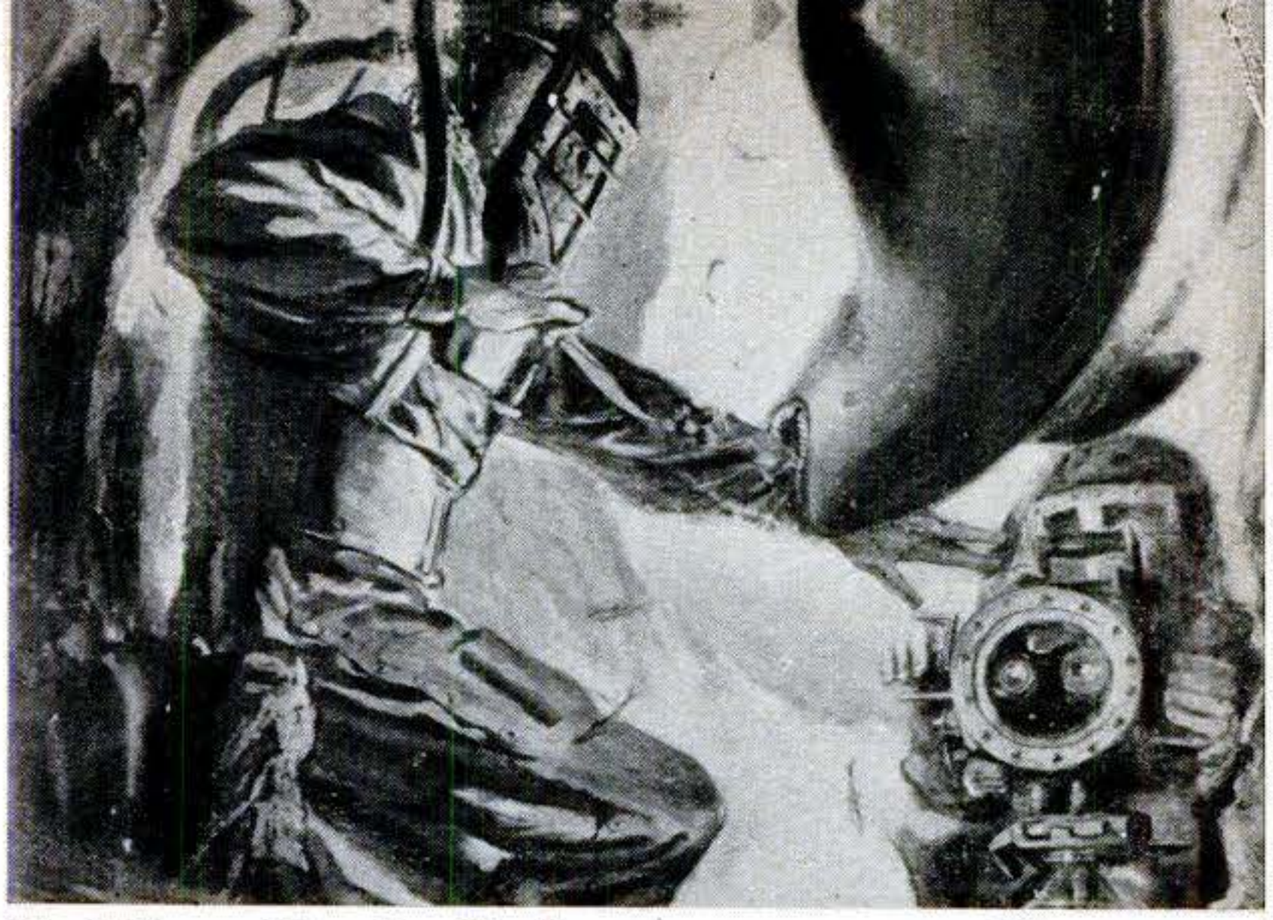
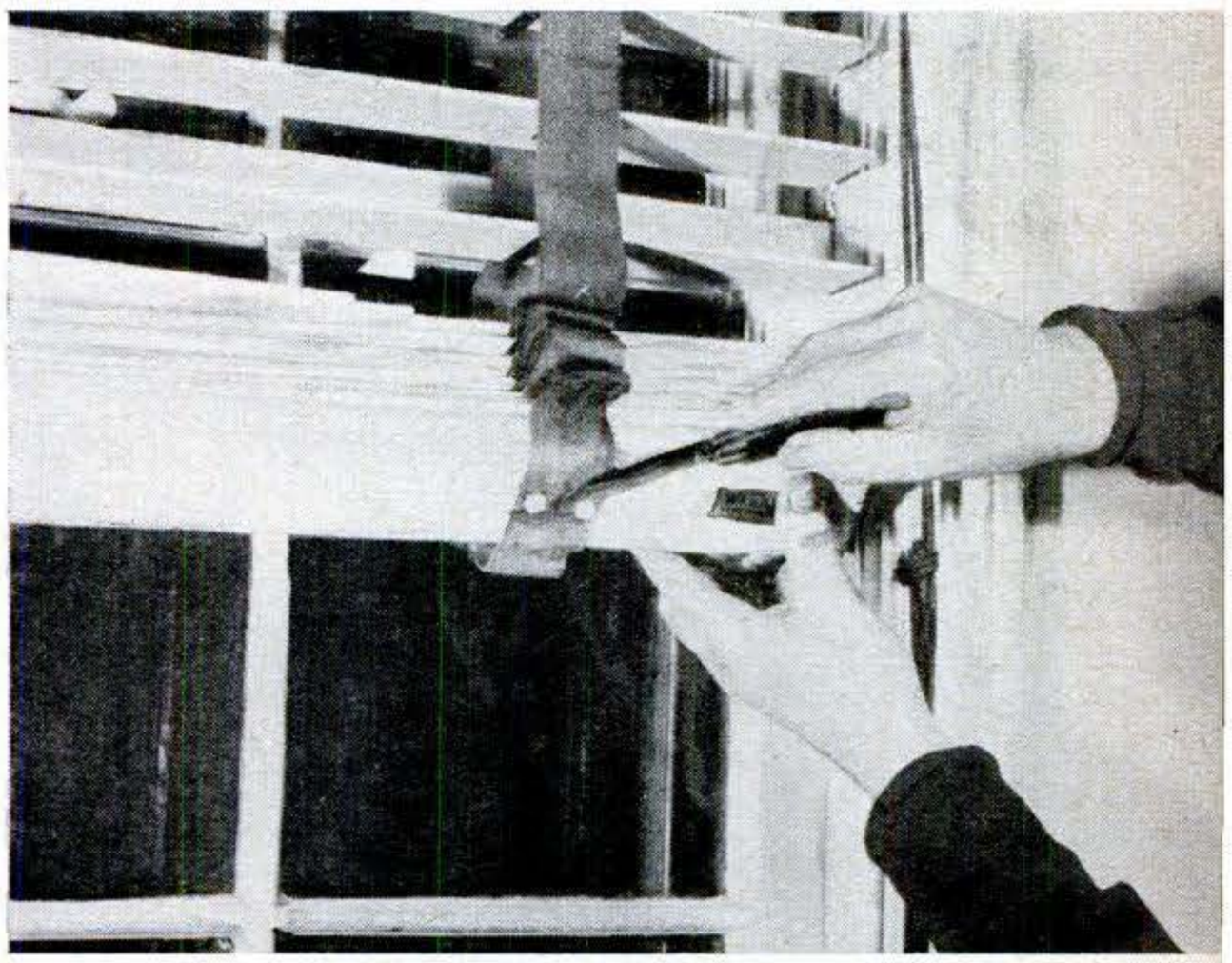
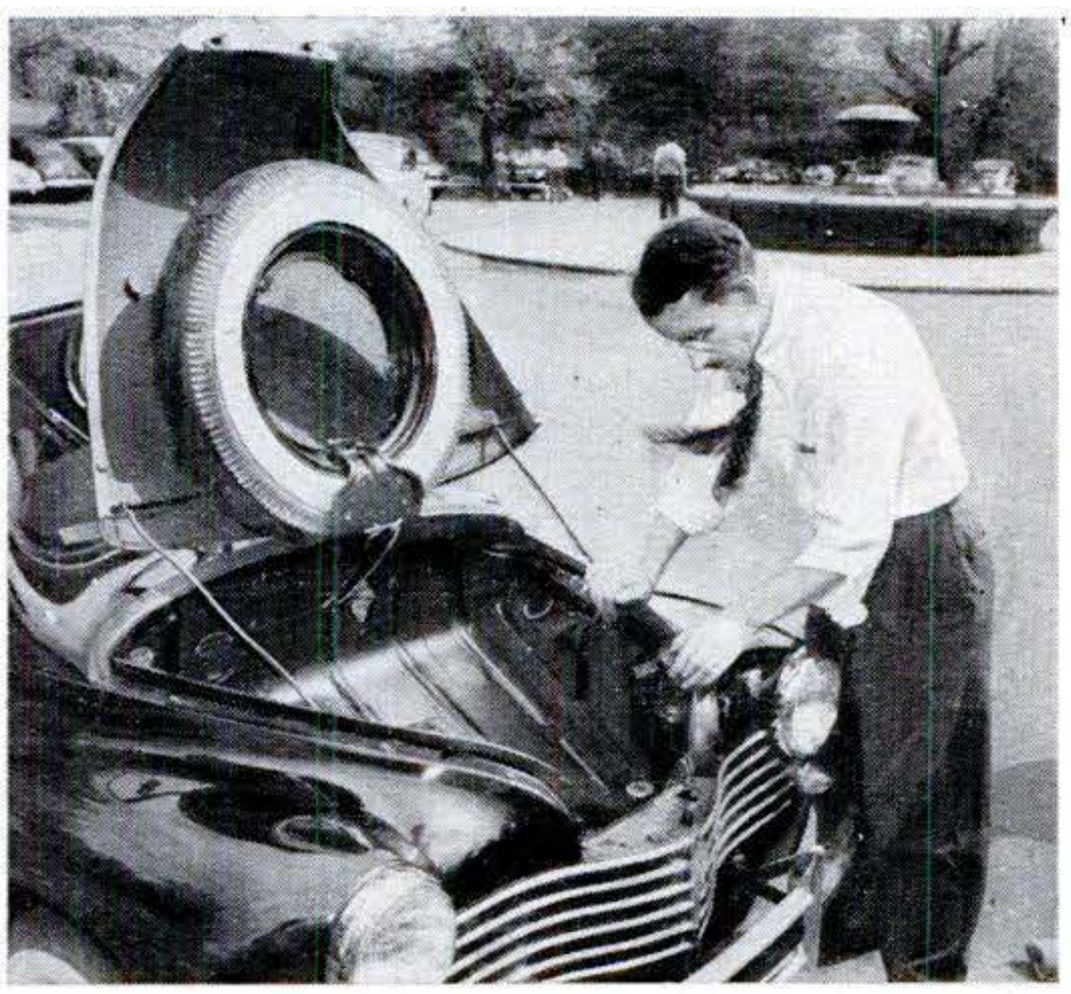


Battling Shark: Undersea cameramen risk their lives to record for you the thrills of an unexpected adventure. **Page 100**

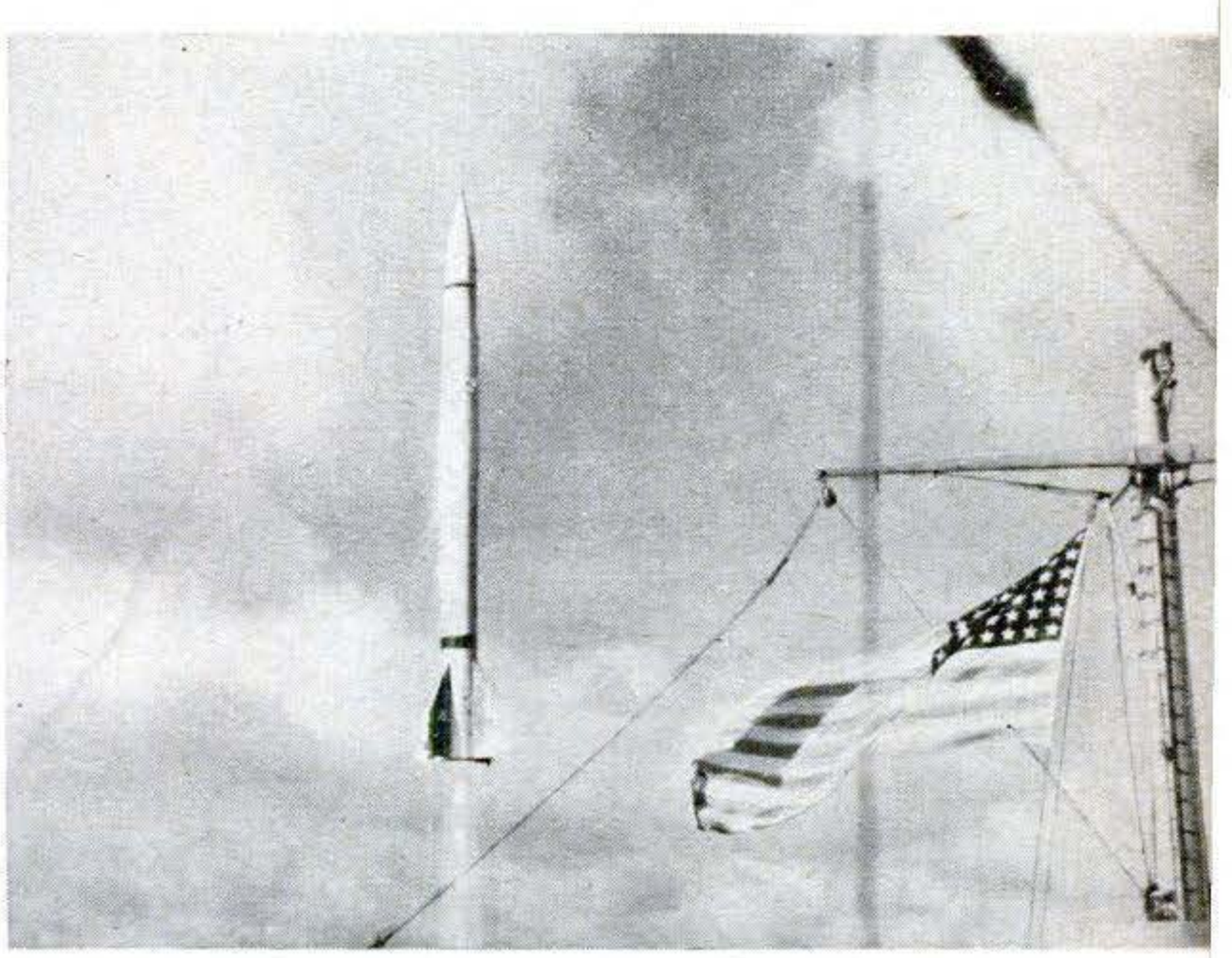
Build a Family Theater: Hodgepodge of TV, radio, and record-player cabinets can be replaced with this neat combination. **Page 174**



When Your Venetian Blinds Break: Here are easy hints that will take the headache out of repairing those broken slats. **Page 191**



Where's the Engine? In this new Renault, it's tucked away in back, but an owner can easily get at it for home servicing. **Page 90**



Up Goes the Viking! From mid-Pacific comes an exciting story in words and pictures of how a giant rocket is launched. **Page 84**

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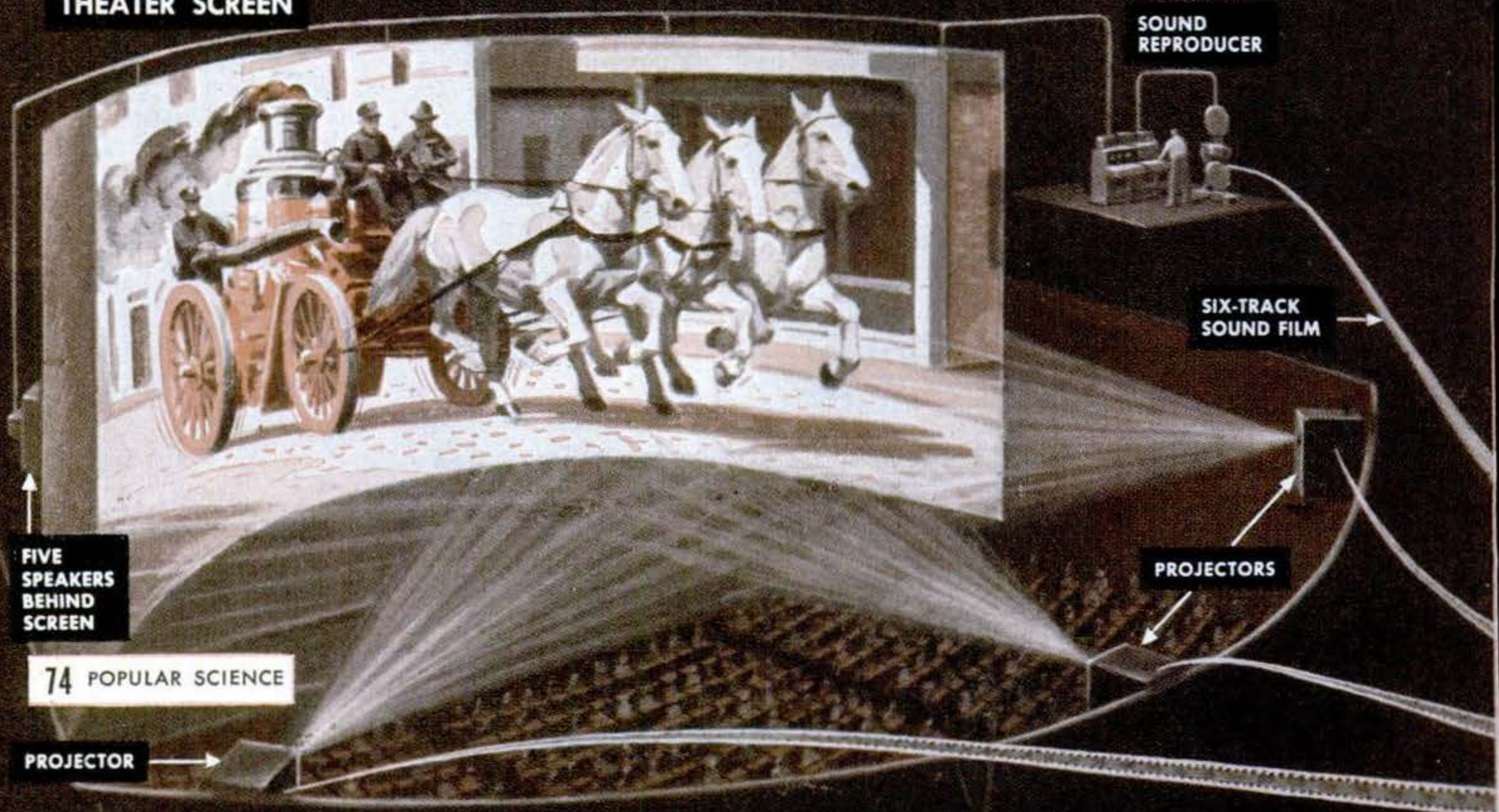
Spectator gets striking impression he's right in room he sees on big curved screen above. Here inventor Fred Waller and two girl assistants appear in Cinerama film introducing super-movies at preview in East Norwich, N. Y., demonstration theater. Pictorial diagram below shows how proc-



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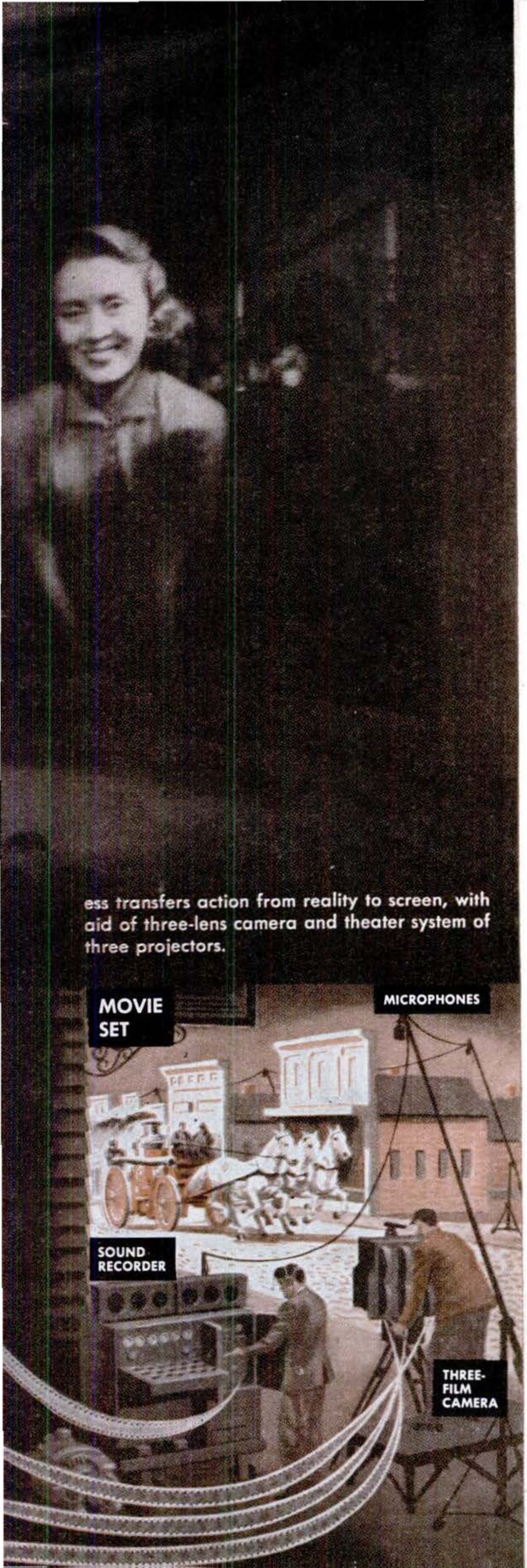

ess transfers action from reality to screen, with aid of three-lens camera and theater system of three projectors.

Cover by Reynold Brown

Super-Movies Put You In the Show

PS takes you behind the scenes where an exciting new technique of film-making is being groomed for its public debut.

By Alden P. Armagnac

PS PHOTOS BY HUBERT LUCKETT

THRILLS that lift you out of your seat . . . action that goes on right around you . . . these are the illusions created in a new kind of movie.

Panoramic sight and sound put the action right in your lap. Fire engines seem to come right at you. Planes roar over your head. You're not just looking *at* this "wrap-around" movie show—you're in it!

Super-movies produced by the new system, known as Cinerama, may make their public debut late this year or early in 1951. Previews of short Cinerama films have been given movie makers and exhibitors at an East Norwich, N. Y., indoor tennis court converted into a demonstration theater. Negotiations are in progress to make the first full-length super-movies and equip theaters to show them.

So powerful is Cinerama's feeling of reality that when one preview "short" portrayed a ride on an amusement-park roller coaster, several spectators became seasick

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CURVED SCREEN has end sections of vertical ribbons, arranged like slats of Venetian blind. This eliminates reflection of light from ends to center of the concave screen, which detracted from clarity of picture there when ordinary screen material was used.

and had to leave hastily. (This reporter stuck it out, hanging on tight to both chair arms.) Super-movies attain this realism by a new departure in methods.

First, they are *not*, nor do they claim to be, stereoscopic or three-dimensional movies. Those require either a special screen that only a limited portion of a normal audience can view from just the right angle, or special spectacles for all viewers, which most movie patrons simply won't be bothered with. No such gadgets are used by Cinerama audiences.

Actually, only a part of the clues that make a scene seem real to you are supplied by binocular, or two-eyed, vision. By skillfully combining others, the Cinerama process gives substantially the same effect.

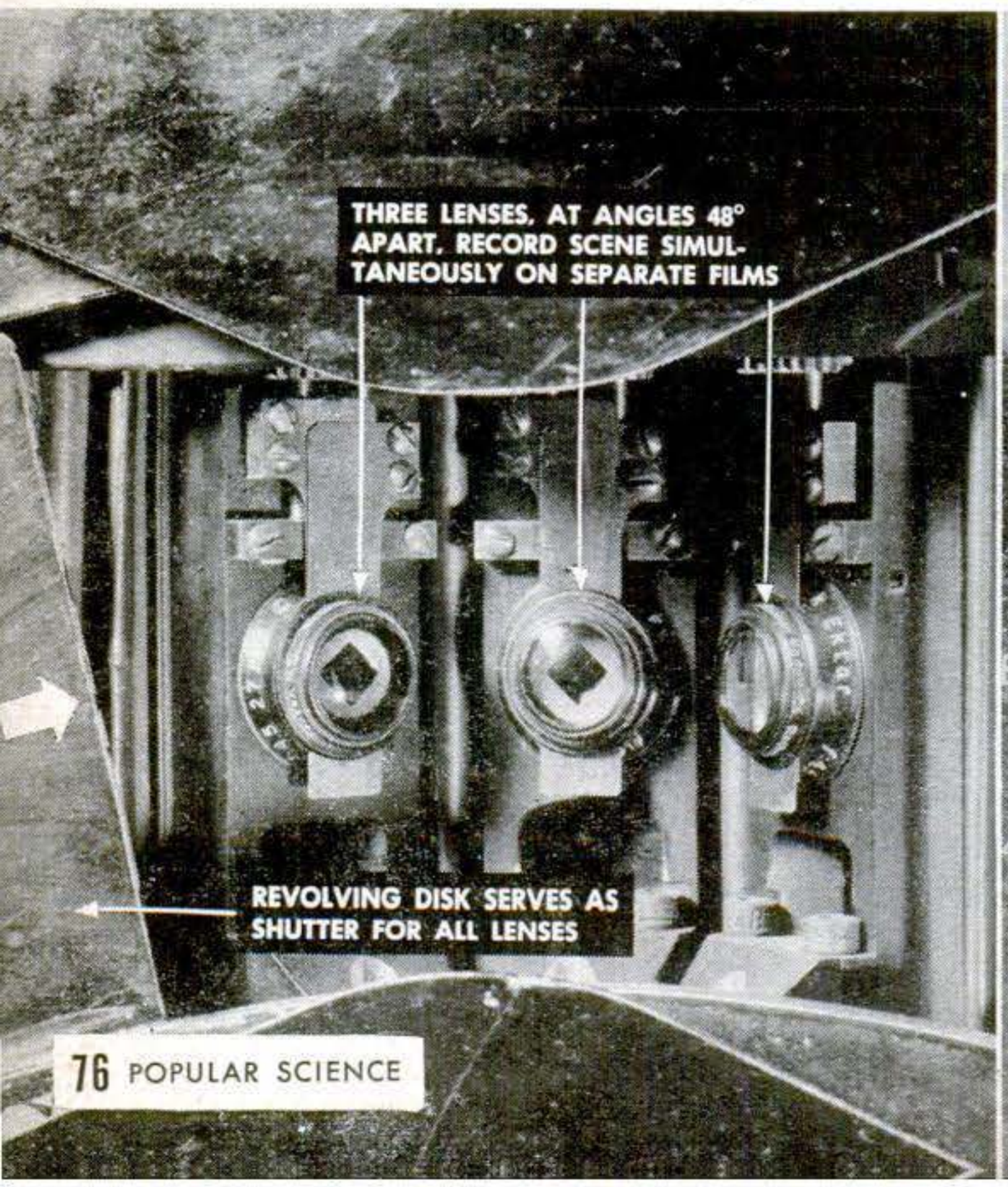
Just as in real life, you can look all around, as well as straight ahead. Cinerama's big "wrap-around" screen of eight times the standard size—twice as high, and four times as wide—forms a great curving arc across your field of view. It seems to surround you with action taking place on it. That gives you the feeling of being right in the midst of things—instead of outside, looking in.

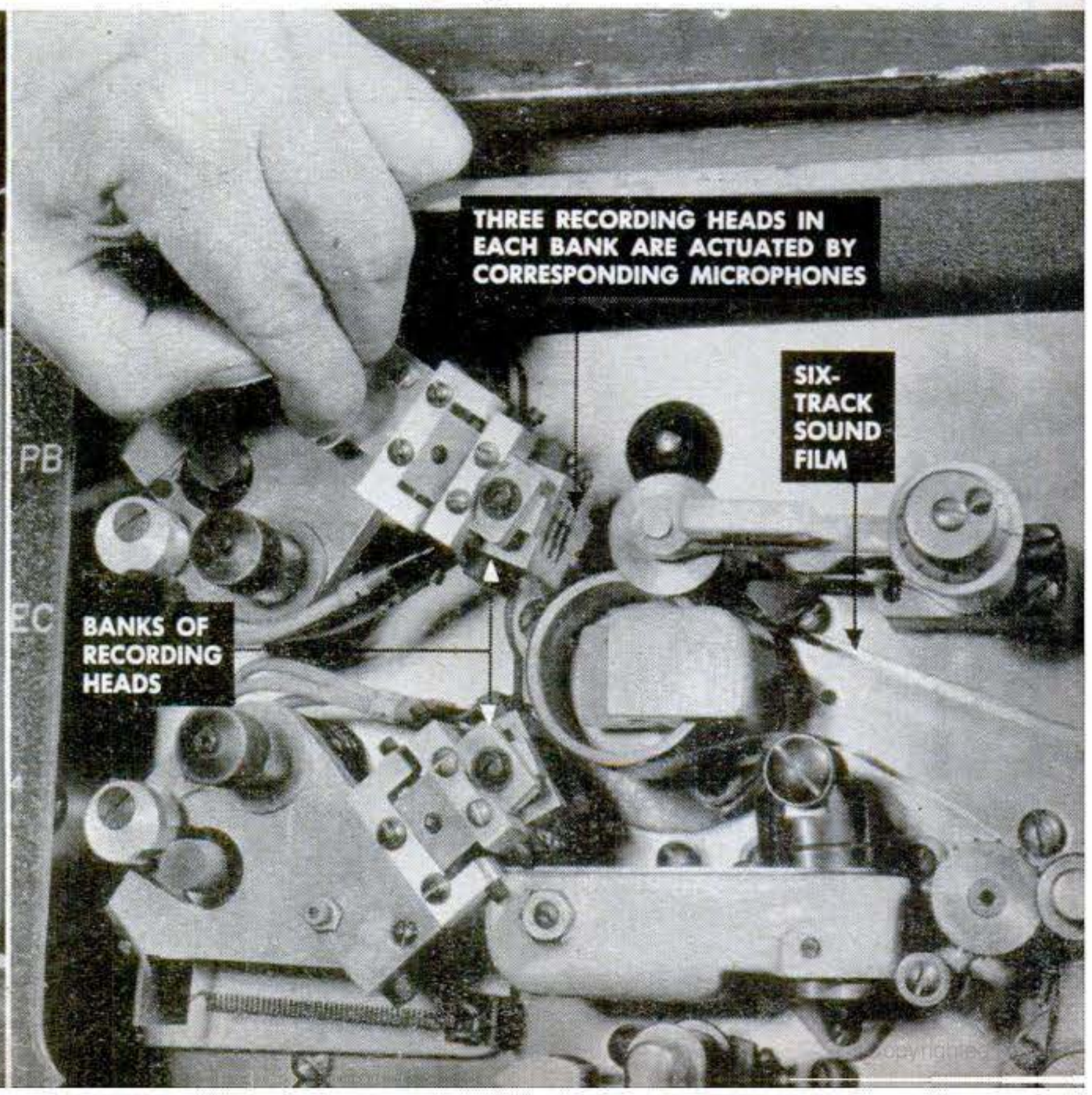
People in close-ups, on this giant screen, fill your vision. They seem so near that you could reach right out and touch them.

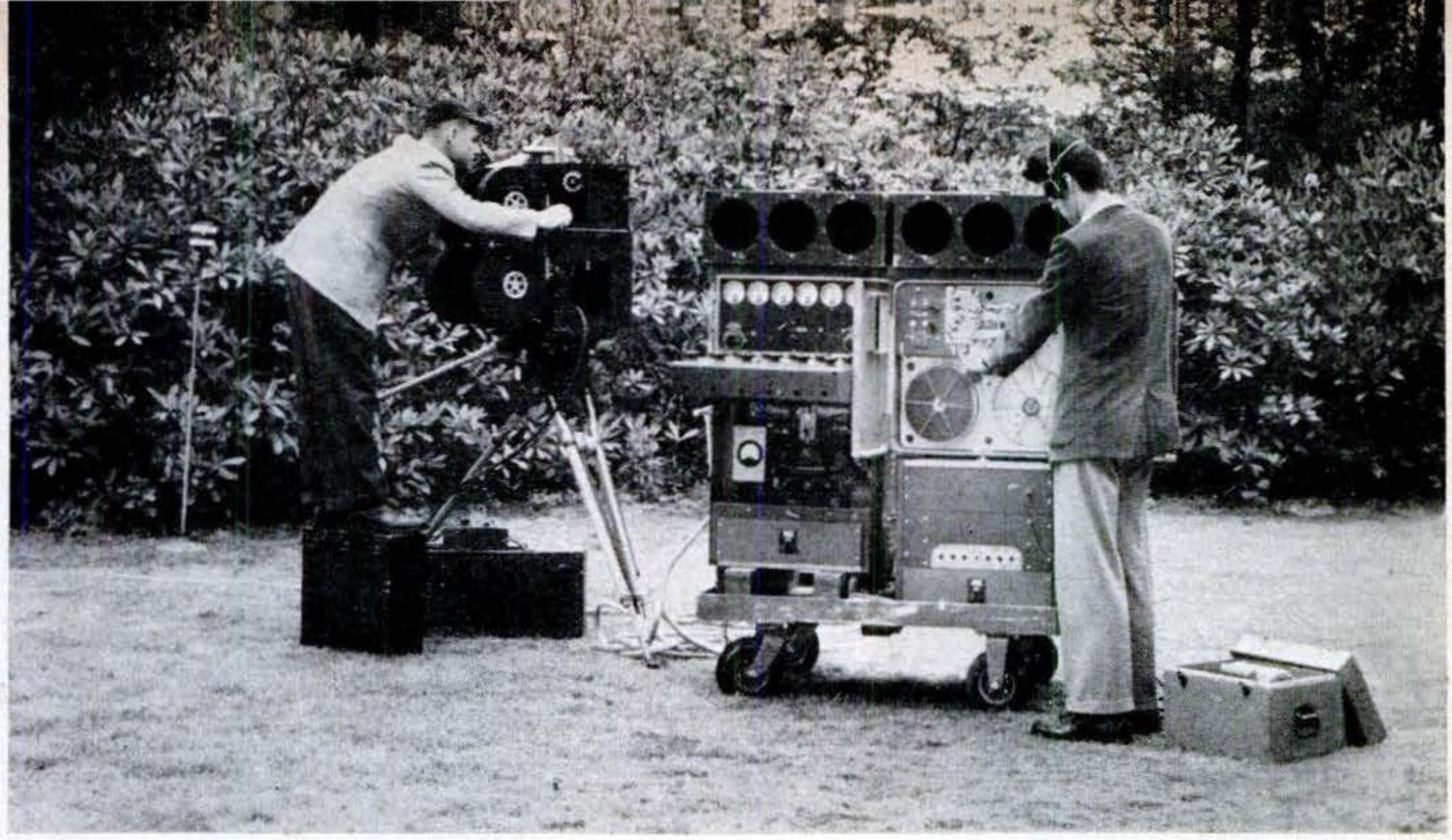
Your impression of seeing the scene through your own eyes, instead of the cam-

CAMERA OF CINERAMA SYSTEM puts scene on three films, each making up one-third of final picture. Close-up, below, is actual-size view of camera's three lenses. Their lines of sight cross at point just in front of them, where single disk shutter revolves as shown by arrow.

SOUND-RECORDING PART of Cinerama system puts everything picked up by six microphones on a single magnetic-type sound film. View of its mechanism, below, shows sound-recording heads, arranged in two banks of three each. Same machine, or similar one, reproduces sound.







FIELD EQUIPMENT for making super-movies, above, consists of Cinerama camera and portable sound-recording outfit. Latter uses six standard microphones spotted at strategic locations.

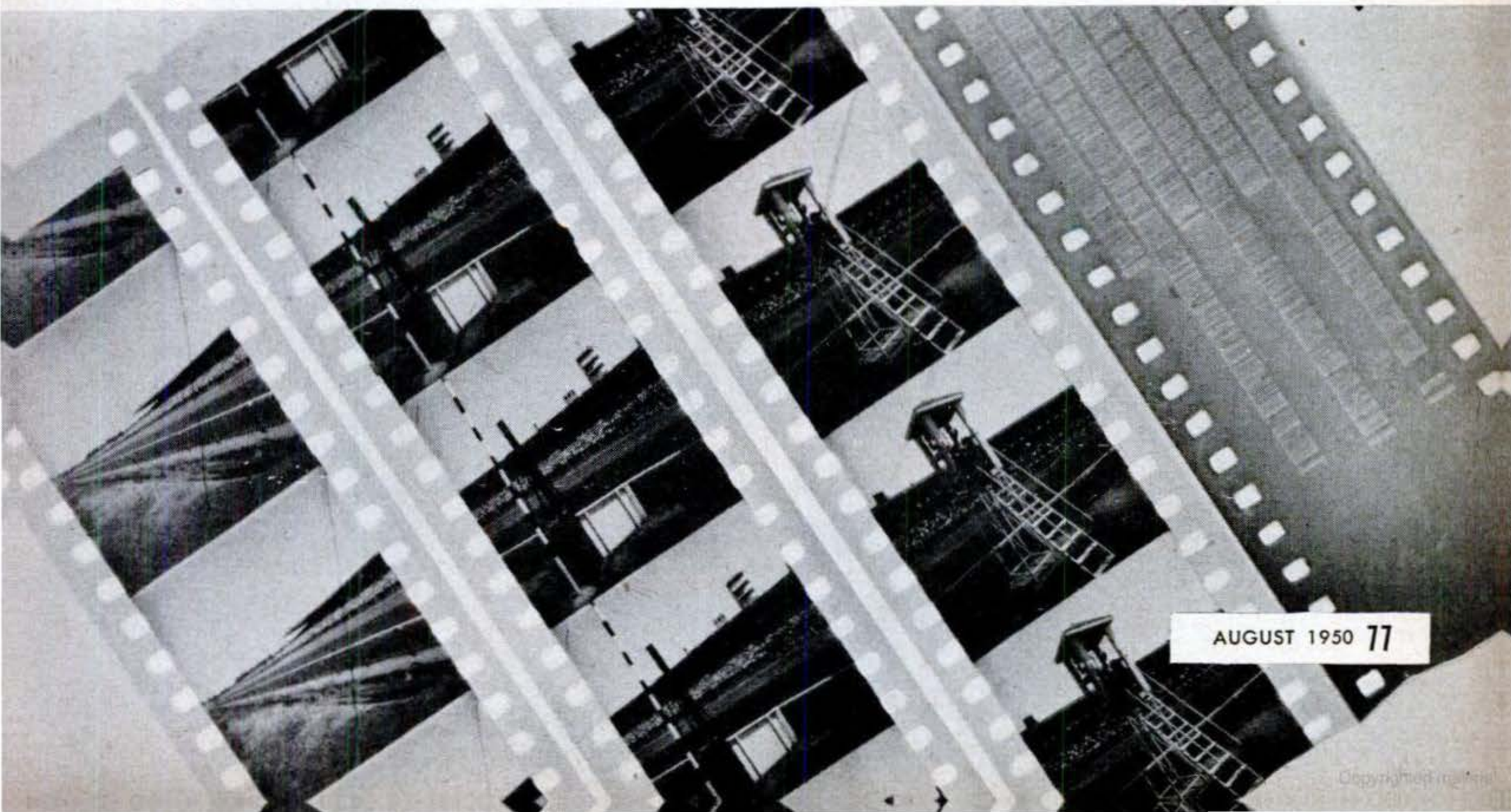
era's, is heightened by picture-taking lenses that match the human eye in focal length and give exactly the same perspective.

As convincing to your ears as to your eyes is the simulation of reality. Wherever an actor may be on the screen, that is where you hear his voice coming from. From behind you, you first hear the voices of a procession of singers, as they march onto the scene from behind the camera.

Filming and projecting a scene of Cinerama dimensions is no small feat. Almost literally eye-filling, the picture covers a field of vision about 146° wide and 55½° high—not far from the extreme limit, 160° by 75°, of human eyes. No single lens, not even a wide-angle one, can satisfactorily take in more than a fraction of this territory.

So the 150-pound Cinerama camera consists of three cameras in one. Its eyes are half again standard height. To make them, camera advances standard 35-mm. film six perforations at a time, instead of usual four. Magnetic-type 35-mm. sound film, with opaque coating of iron oxide, needs no laboratory processing and it can be played back immediately.

PUT THESE FOUR FILMS TOGETHER and you have a Cinerama movie. First three form left-hand, center, and right-hand parts of picture, when projected side by side on theater screen. Dark film at right carries six sound tracks that operate theater's speakers. Picture frames are



three matched lenses, of 27-mm. focal length, set at angles 48° apart. Each lens records one-third of the total width of the scene, upon one of three standard 35-mm. films carried in as many film magazines. Otherwise, the three sections operate as one. Lines of sight of the three lenses converge and cross at a point 11/16 of an inch in front of them, where a single revolving-disk shutter serves them all, assuring synchronization of exposures. One knob simultaneously focuses all three lenses. Another knob controls diaphragm settings in unison.

Individual Cinerama frames are half again standard height. Since three strips are used, the total amount of picture film used is 4½ times as much as for a standard movie.

After the camera has dissected the scene into three parts, it remains for the theater's projection system to put the parts together again. This requires three projection booths instead of the customary single one. Installation of these booths and of the large curved screen will adapt existing theaters to show Cinerama films.

Projectors' Angles Match Cameras'

From angles like those of the camera lenses, the theater projectors throw the three sections of the picture side by side on the screen. The center section of the screen is curved, usually on a 25-foot radius, and two flat wings are tangential to this curve. The depth of focus of the projecting lenses is great enough so that the curvature of the screen presents no problem.

An innovation in each projector is a mechanical device nicknamed a "gigolo," because it jiggles up and down. Just as a photographer makes a vignette, this mask with a saw-tooth edge moves along the border of a film, so that the picture gradually fades from view at its edge. Thus adjoining films blend together on the screen without a conspicuous dividing line.

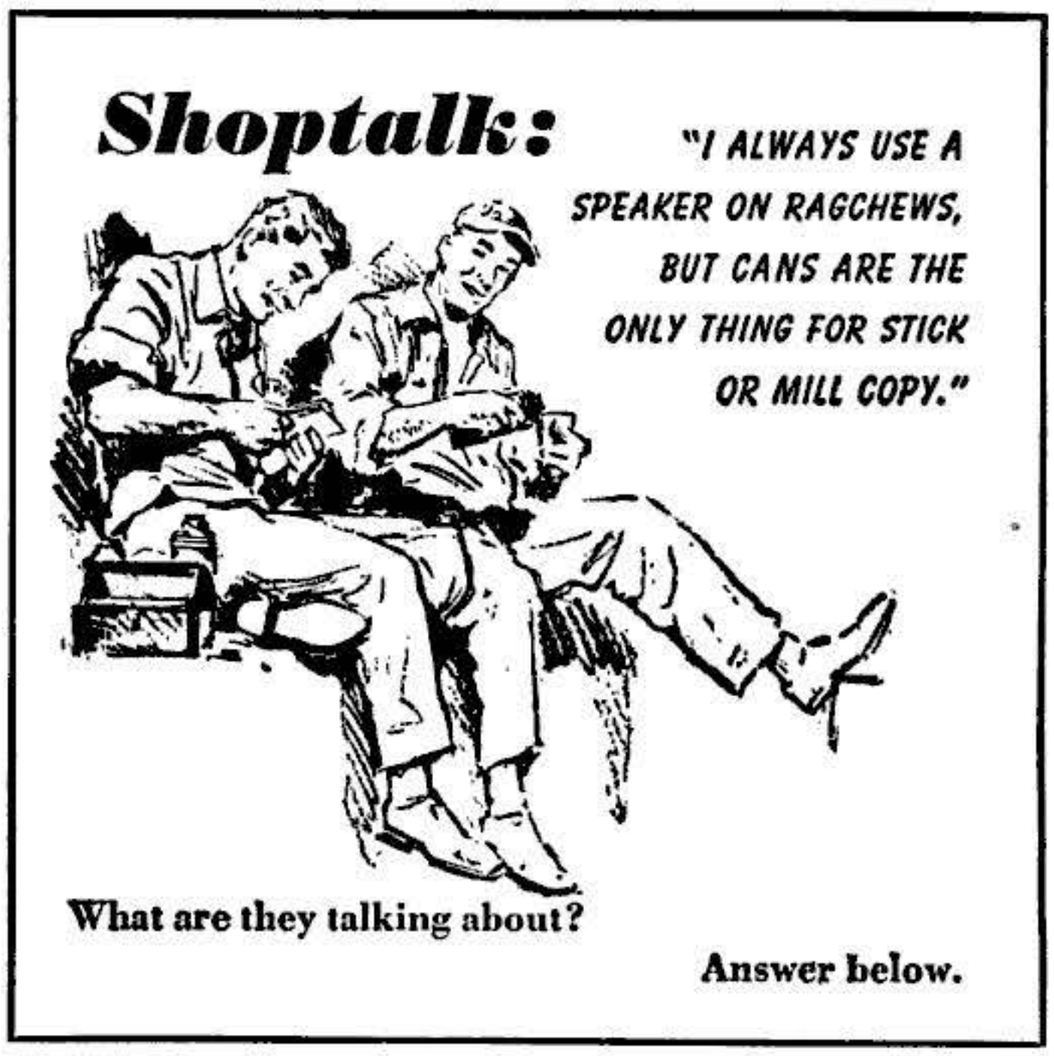
For realistic sound effects, six microphones in the field make individual tracks on a single 35-mm. sound film used for this purpose alone. Theater speakers, arranged in the same pattern as the microphones, are individually operated by the sound tracks. This produces the striking "sound-perspective" illusion that makes voices and music come from the right directions. A favored technique places five microphones and speakers, respectively, in a row across the full width of the movie set and the theater screen. The sixth microphone is put some distance behind the camera and picks up "off-stage" sounds, reproduced in the theater by a speaker at the rear of the audience.

Recent strides in magnetic recording have led to the choice of magnetic-type sound film, which needs no laboratory processing and can be played back at once.

Like conventional movies in their infancy, the preview films are not entirely free of technical faults; for example, straight lines are distorted by certain camera angles, which must be avoided. As the sponsors point out, these are experimental films, which will be bettered as the possibilities and limitations of the novel technique are more fully explored.

Super-movies are the invention of Fred Waller, former Paramount Pictures executive, and designer of the Waller Gunnery Trainer (PS, Sept., '43, p. 65). His experiments with Cinerama began in 1938. War interrupted its development for entertainment, but it was incorporated in Waller's trainer. This used a five-lens camera and five projectors to portray airplanes realistically on a curved screen as Air Force practice targets. Since the war, he has developed the simpler three-lens process.

Will theaters adopt super-movies to offer their patrons new thrills in entertainment? Facing the growing competition of television, the movie industry has been seeking a way to meet the challenge. Cinerama's sponsors believe they have the answer. END



They're amateur radio operators. He's telling his buddy that he uses a loudspeaker on his short-wave receiver for general conversation, but that earphones are the only thing when writing down messages with a pencil (stick) or typewriter (mill).

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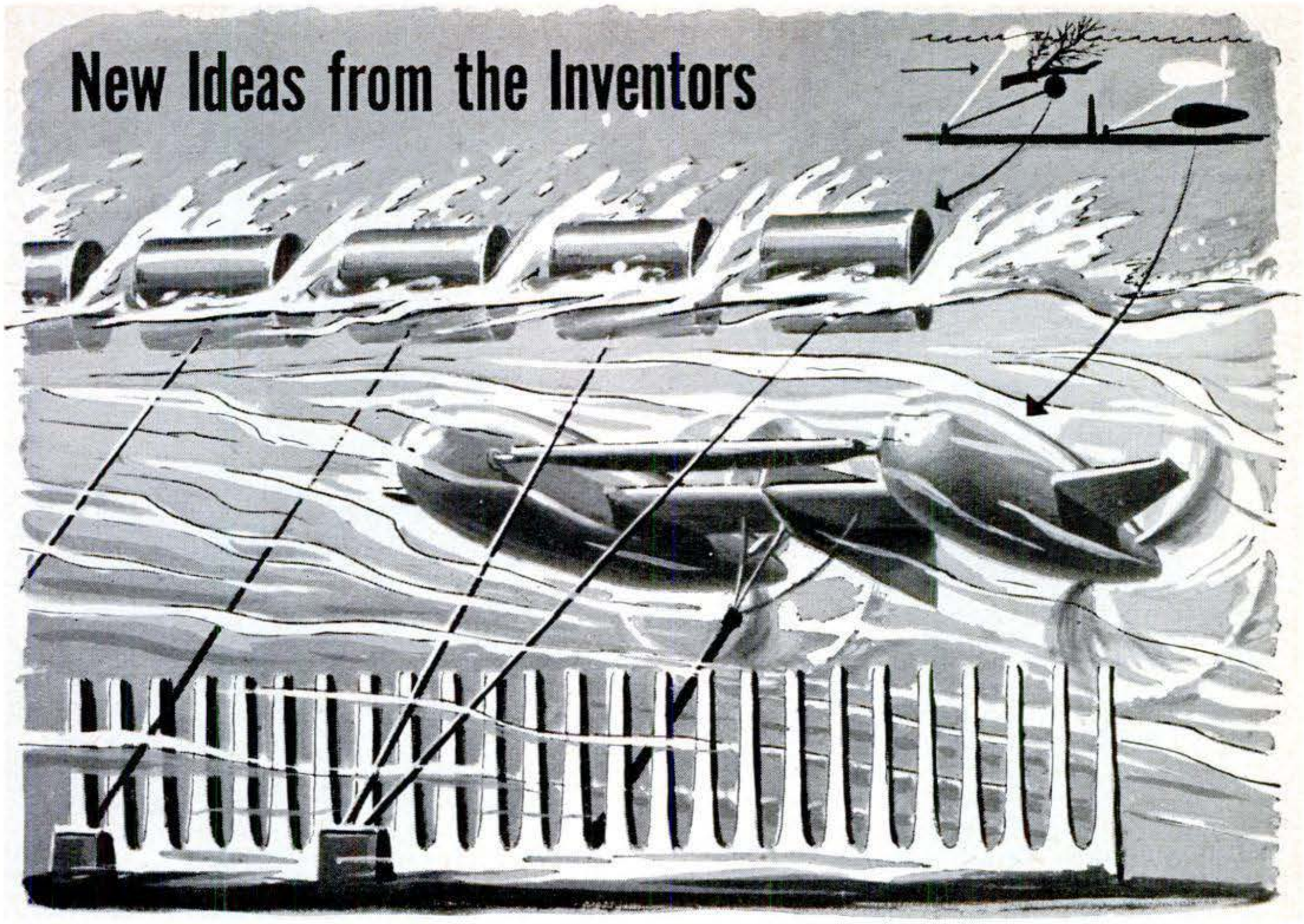
New Ideas from the Inventors



1 Stream Turbines Give Power. This underwater power plant for use in fast-running rivers resembles twin torpedoes joined by wings. The tail propellers, spun by the flow of water, drive electric generators inside. When floating debris or ice strikes protective floats anchored upstream, a control system folds the props and tilts the wing, causing the unit to dive behind a guard rake until the debris passes.

2 Air Flow to Speed Ironing. A small electric fan and ventilating system are built into an ironing board to provide a continuous flow of air up through the pad and cover. This, the inventor explains, not only helps keep the pad dry, but also assists the iron in removing the moisture from the fabric being pressed.

3 Roll Painter Has Own Feed. A feed roll, dipping into a storage well, transfers the paint to the applicator roll in the latest roll painter. Thanks to a gravity-operated axle mount, the feed roll moves away from applicator when the handle is held vertical. This stops paint flow so applied paint can be worked in.

Turn the page, please, for three more new ideas

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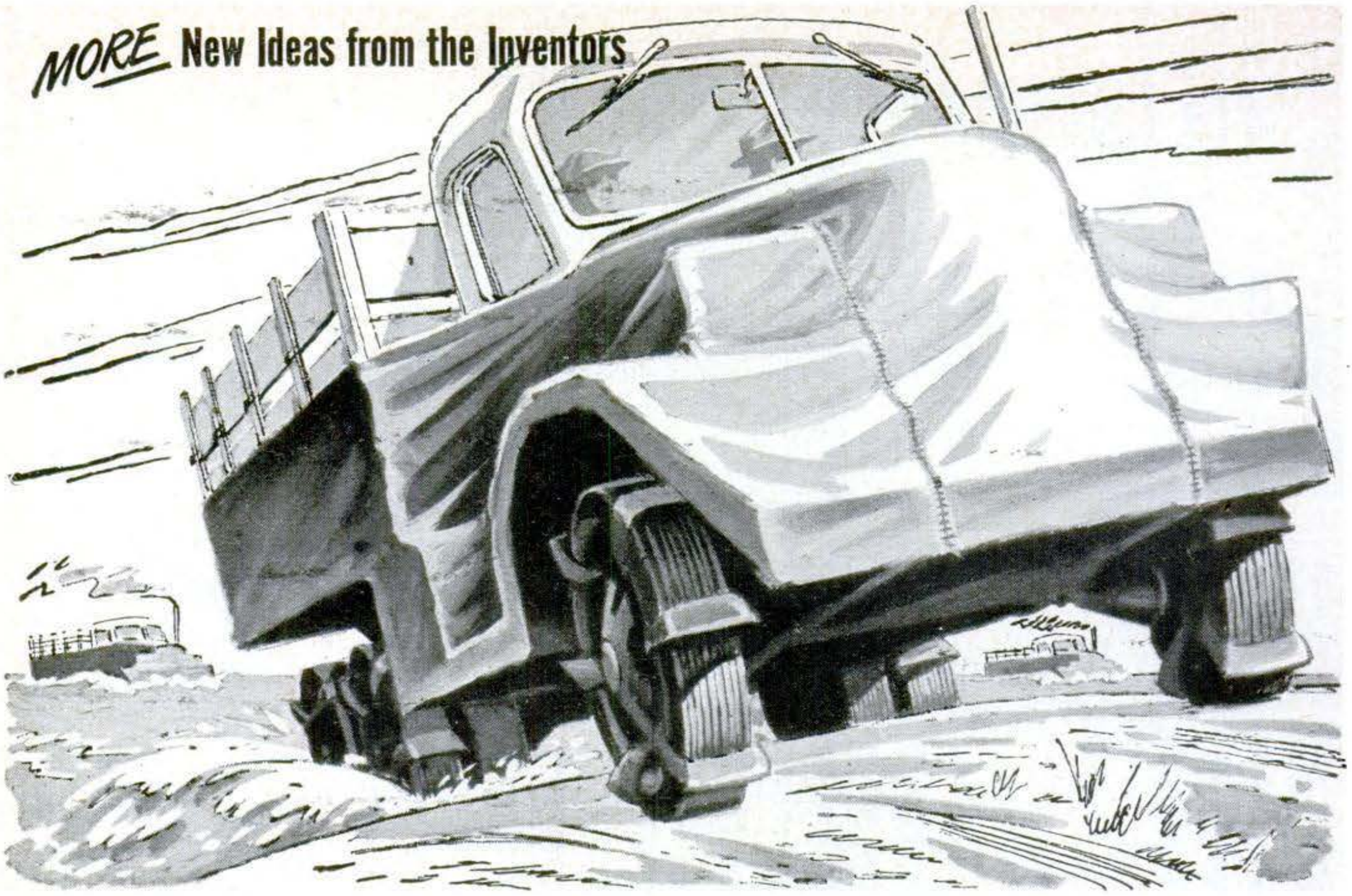
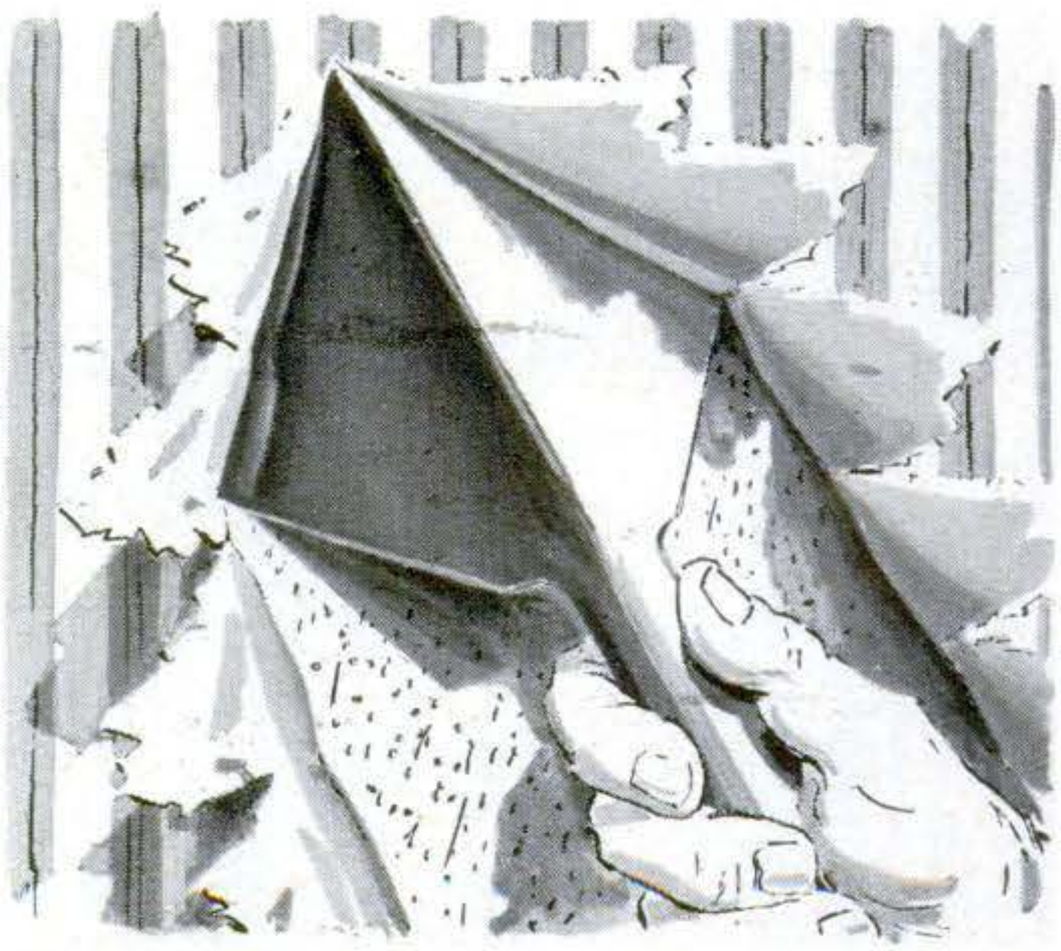
MORE New Ideas from the Inventors



4 Cover Makes Truck a Duck. A truck or a car can be transformed quickly into an amphibious "duck" with a form-fitting zip-on cover designed to make the entire lower portion of the vehicle waterproof. The cover, completely encasing the chassis and hood, is fastened around the axles with waterproof metal clamps. Cup-shaped fins, strapped around the tires, provide for propulsion in the water.

5 Child's Tray Fits Counter. Feeding a youngster at a soda or lunch counter would be no problem with this tray. Its forward end rests on the edge of the counter, while U-shaped slots in the ends of the two side members fit around the two uprights that support the back of the stool, holding the tray firmly in place.



6 Cutter to Remove Wallpaper. Acting like a snowplow, the V-shaped, twin-edge cutter shown is designed to simplify the job of peeling off old wallpaper. Because it comes to a point, the cutter can be started into the paper easily, and when pushed forward the V-shaped edges turn the paper back out of the way.

Patents on these inventions have been granted to: 1. E. Souczek, Vienna, Austria; 2. L. Mueller, Milwaukee; 3. B. Dean, Pittsburgh; 4. A. Benson, Hopewell, N. J.; 5. G. Stanton, Worcester, Mass.: 6. A. Singer, Los Angeles.

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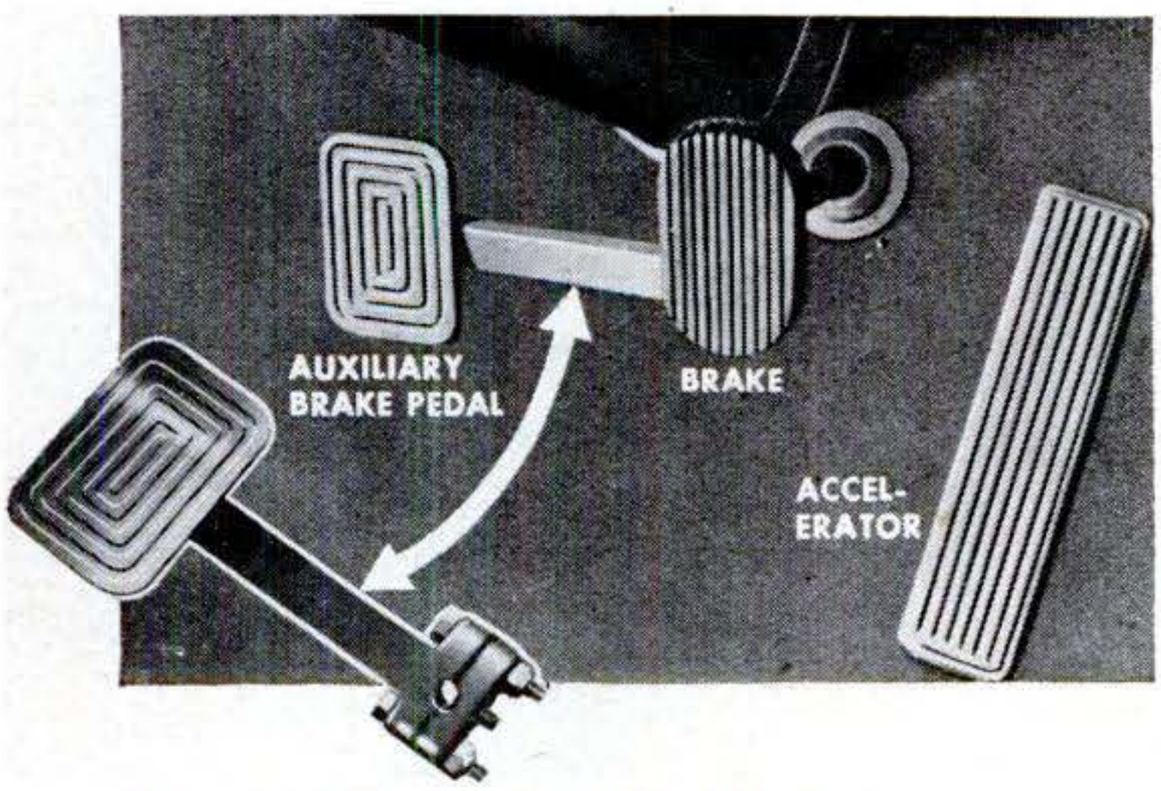
You See Your Party On New Video Phone

JUST as imaginative writers have forecast for years, you can now see the person you're telephoning—if you're in a television phone booth developed by the U. S. Army Signal Corps at Fort Monmouth, N. J. At right, Corporal James J. Rhoads demonstrates how it might end blind dates. As he converses with Wac Pfc. Dorothy J. Burrus, he can watch her on the television screen. For sterner military purposes, the two-way video phone transmits tactical maps, charts, reconnaissance photos, and other important pictorial information. Voices travel by customary telephone connections, and picture images by coaxial cable. The lens of the television camera is visible below the screen. It picks up either the face of the speaker or pictorial matter held before it. Booth is equipped with built-in lamps for video illumination.



Extra Pedal Aids Driver

AN AUXILIARY pedal (above), attached to the brake of a car with an automatic transmission, makes it easier for your left foot to operate the brake while the right one remains on the accelerator. Its use is said to stop car creeping, facilitate parking, prevent stalling, make it easier to put the car in reverse, and start the car on an upgrade, after a full stop, without rolling backward. The device is the product of the Hold-N-Bar Co., Detroit, Mich.

Pen Writes in the Dark

WRITING in poor light is simplified for physicians and reporters by a fountain pen with a built-in flashlight—a new version of a combination attempted with varying success in earlier designs. Introduced in Germany, the latest type offers a ball-point pen with a translucent-plastic writing end, illuminated by a tiny bulb concealed within. The battery of the pen has a life sufficient to power the writing spotlight for three hours of continuous use.

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WILBUR SHAW Reports the New Cars From the Driver's Seat

America's best-known man behind the wheel to give Popular Science readers his impressions of what's new and interesting in automobiles.

By Perry Githens *Editor, Popular Science*

INDIANAPOLIS SPEEDWAY — Wilbur Shaw, three-time winner of the famous 500 and head man of the Indianapolis Speedway, will do a new kind of mobile report for this magazine.

Equipped with lip-microphone and tape recorder, Shaw will "interview" the new cars *while he drives them.* He'll talk the cars through traffic, along country roads, and around the track of the champions he knows so well. In what is literally a running commentary, he will give his personal impressions of how the cars handle under various conditions.

Probably nobody is better qualified to talk about automobiles than Wilbur Shaw. He has lived with them since he was an Indianapolis kid who grew up in the Speedway.

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He cleaned parts, built cars, and "raced dirt" for years before he got his chance in the Big Race. Then it took ten more years before he won the 500 the first time.

Like so many racing drivers or jet pilots or submarine skippers you meet, Shaw looks the part. He has the deep lines, creased out from the eyes, that men get who have looked often at danger. Standing still, you might take him for any lean, graying young executive who gets in a lot of golf—which he does. But when Shaw moves, he shows the smooth coordination of a fast man with a pistol—which he is. He is also pretty good with airplanes, speed boats, and fishing rods.

Talk with Shaw about automobiles, and you sense his affection for everything that moves on wheels and makes a noise. Ride with Shaw, as I did, and you know his respect for the machine, the passenger, and the public.

When I settled myself in the front seat of the Mercury that had been the pace car in the race this year, I knew I could relax. Shaw is the kind of driver who would no more wrench a car with excessive acceleration than he would kick a child. Inching through Indianapolis traffic or rolling proudly around the empty Speedway, I enjoyed the scenery.

Shaw is as much of a champion for safety as he is for speed. He hates show-offs—on the road or on the Speedway. He thinks good driving is more a matter of personal attitude than of rules.

"A man steps into an elevator," says Shaw, "takes off his hat, politely bows a lady through the door and into her car. Then he climbs into his own car and starts blowing the horn if she doesn't get going—that's what I mean by attitude."

As an airplane pilot, Shaw's passion for quick propulsion has piled up a lot of hours in his logbook. But he also likes to ride trains, and he keeps a couple of motorcycles around for sparetime amusement. His idea of real fun, however, is to take a spin in a new car—preferably clear across the country.

Once in a while he borrows a helmet and old shoes to wheel a car around the Speedway, just to see what he can coax out of somebody's latest combination of motor and chassis. But his own helmet will stay on the shelf in his nice big office except for one little ambition: he'd like to crack the world's speed record out on the Utah salt flats.

Shaw thinks that cars are like guns—they're all good but some are better. Every make of automobile or kind of springs and drives has its enthusiasts, and they all like to talk shop. Now they have a chance to listen to America's Number One driver—who is also a fellow reader of POPULAR SCIENCE. END

OLD TIMER, NEW WINNER—Wilbur Shaw, President of the Indianapolis Motor Speedway and three-time winner himself, greets Johnny Parsons, winner of the 1950 race, at the finish line.

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Ship-Launched Rocket Zooms 106 Miles Up

Mid-Pacific experiment foreshadows the day when our Navy may add huge guided missiles to its seagoing striking power.

By Warren Hughes

ABOARD U.S.S. *Norton Sound*
NEAR JARVIS ISLAND, MID-PACIFIC

DURING the hushed waiting you see Viking Four, that latest and most advanced of the Navy's high-altitude rockets, standing quietly on the *Norton Sound*'s fantail. A gleaming white under the equatorial sun, it seems lifeless, like a massive finger pointing the direction of its imminent flight.

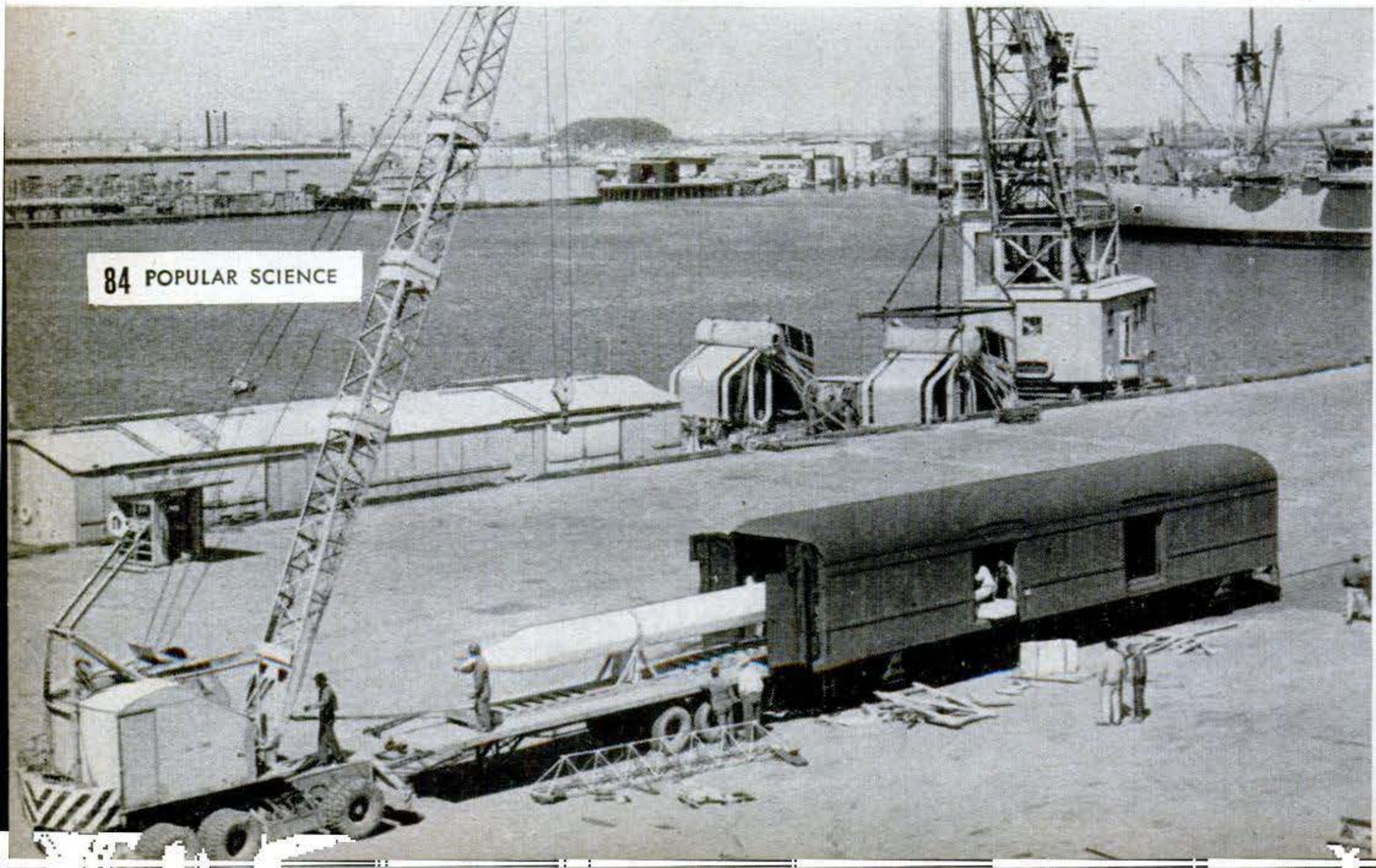
But already cosmic-ray, pressure-measuring, and telemetering instruments mounted in the nose cone of the 49½-foot rocket are clicking away. And you know that in a few moments the rocket, fueled and poised, will take its first breath of fire and will spit roaring flames to boost itself into the ionosphere.

The controller's voice drones on, marking the count down of final seconds. The tension mounts. Even veteran missile men involuntarily hold their breath.

During the last three seconds not even the controller's voice is heard. Firing personnel correct for the ship's roll, pitch, and yaw to obtain absolute stability in the rocket. Then, with all conditions controlled, the firing button goes down.

The spring-operated boom breaks its contact with rocket instrumentation. The rocket begins to take on life. Immediately a manganese compound catalyst mixes with powerful hydrogen peroxide, setting off a violent reaction, operating a turbine to pump propellants into the rocket motor. Simultaneously a pyrotechnic flare inside the rocket ignites the fuel mixture. The high-temperature steel alloy of the motor's interior turns cherry red like a depot stove in midwinter: it is even shaped like a squat, potbellied railroad heater. But there the resemblance ends, for it withstands 5,000° F.

The end of a journey and the beginning of another for the slender Viking Four as it emerges from a railroad car at Port Hueneme, Calif., for transfer aboard the U.S.S. *Norton Sound*.



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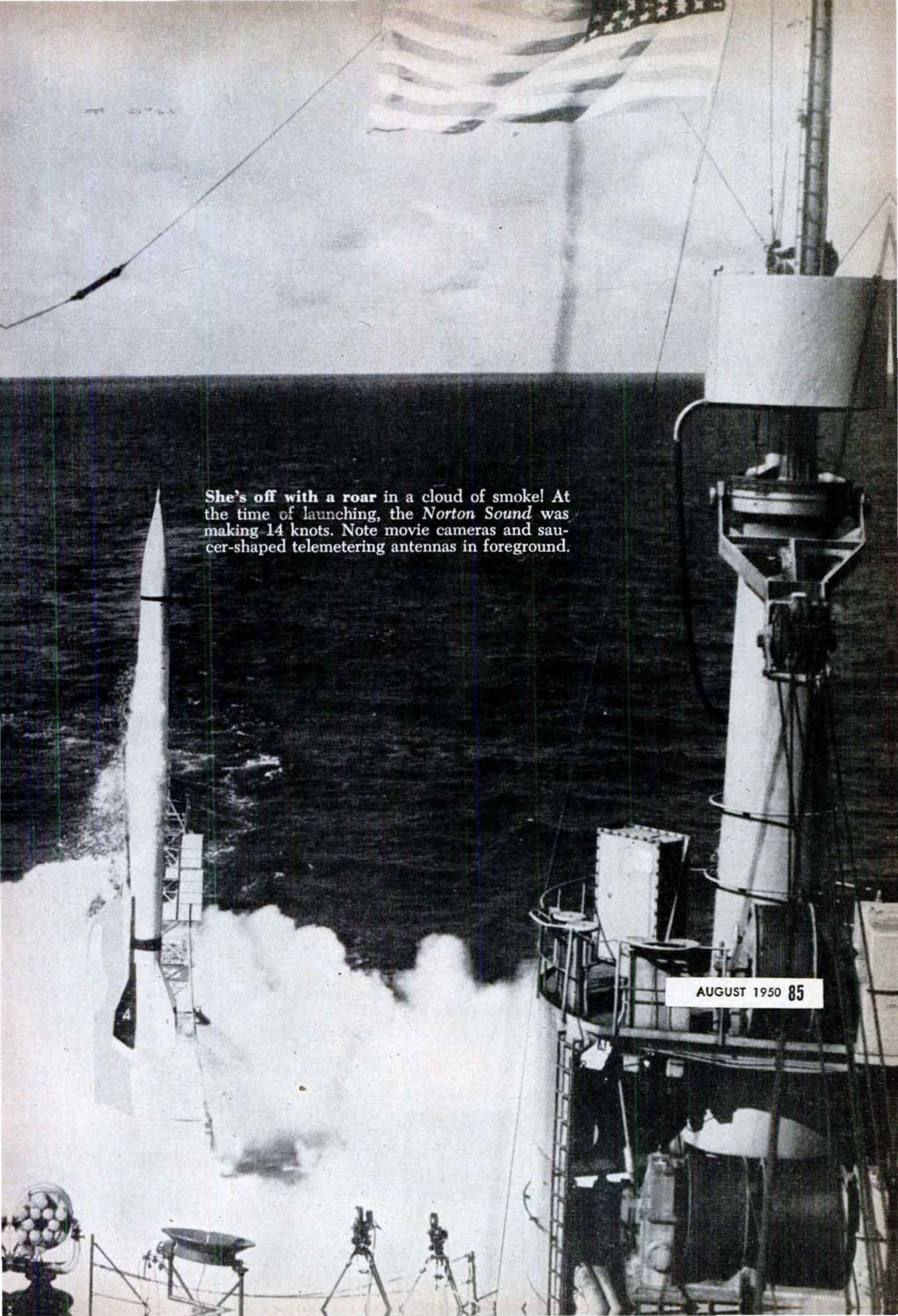
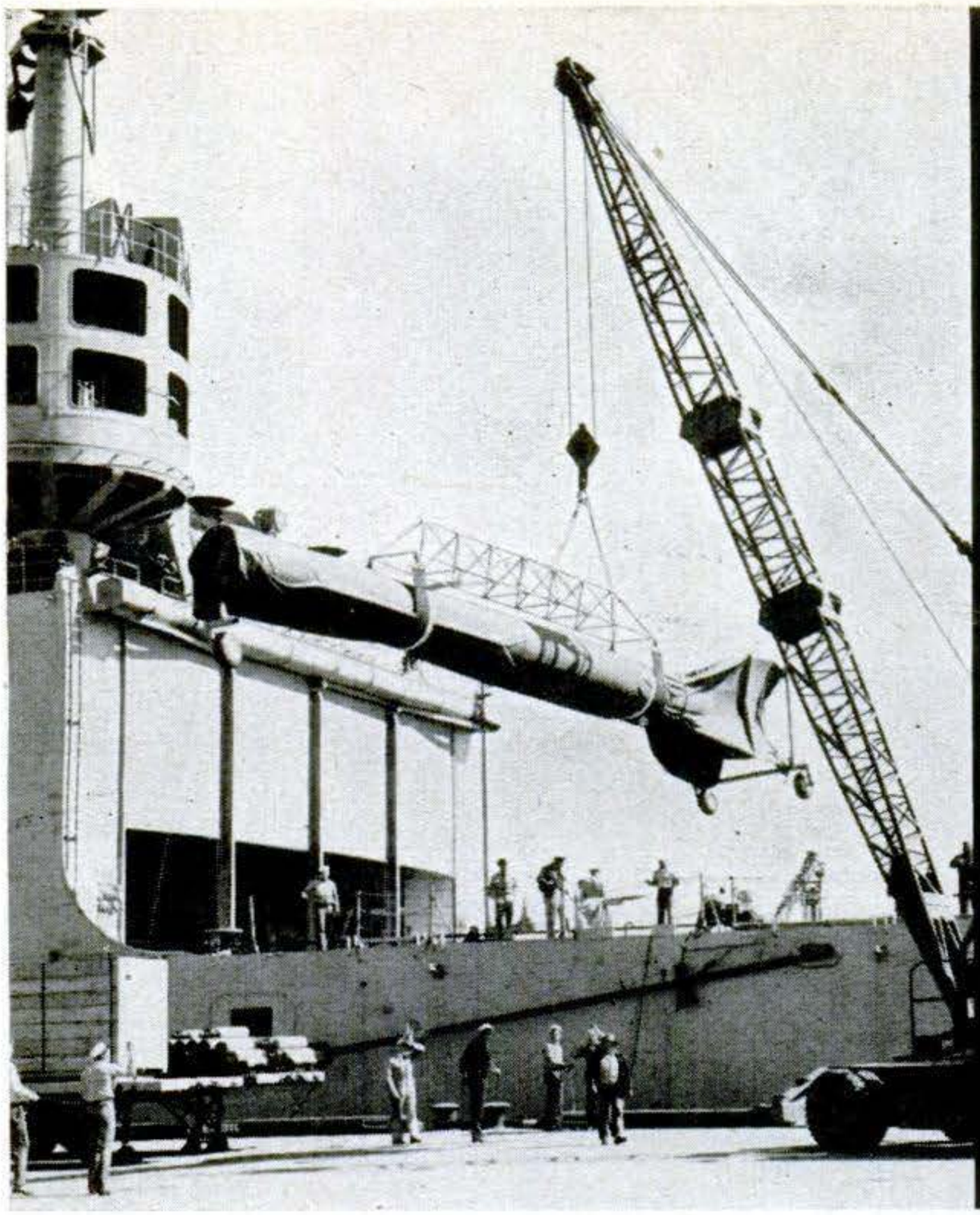
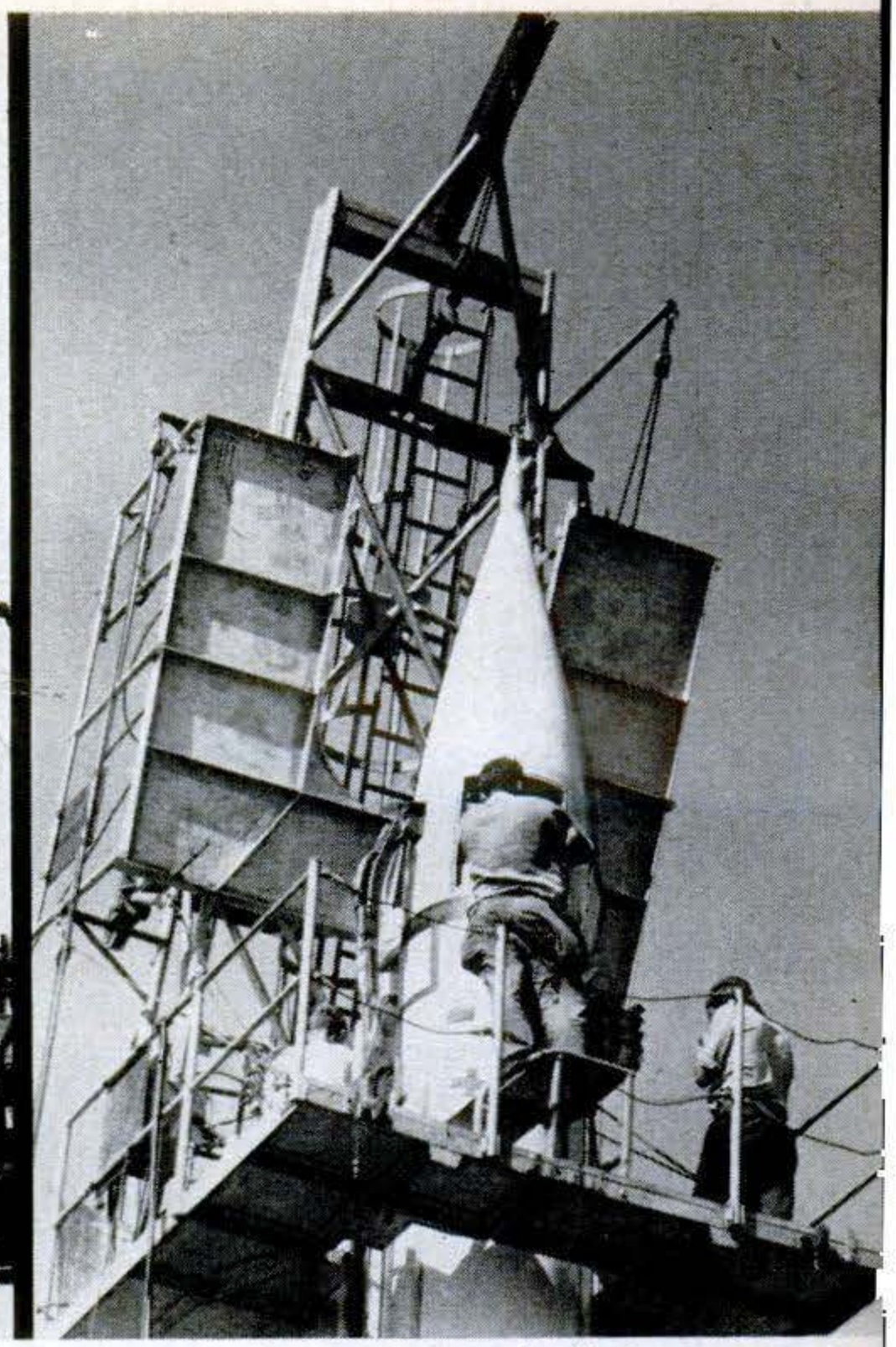


She's off with a roar in a cloud of smoke! At the time of launching, the *Norton Sound* was making 14 knots. Note movie cameras and saucer-shaped telemetering antennas in foreground.



Glad to have you aboard, Sir! The Viking rocket is swung onto the launching deck. During the voyage, it was housed in hangar deck at left, which also served as technicians' workroom.



On servicing tower, almost 50 feet above deck, experts work on the rocket's instrumentation section. More than 300 vacuum tubes were used for gathering and transmitting scientific data.

heat as it shoots forth a roaring stream of fire. Its kick is 20,000 pounds of thrust—straight up.

The rocket starts climbing slowly, as if reluctant to leave the ship. Then it seems to make up its mind, gathers speed and flashes skyward. If you want to follow its flight you have to lie on your back, for the fire-spitting Viking streaks overhead like a fast-moving white needle trailing an orange-blue thread. Zooming through the clouds, its nose heats up to a searing 500° F.

At 10 miles or so the rocket begins making a white vapor trail against the blue overhead. The vapor trail stops at about 20 miles above sea level as the rocket leaves the dense atmosphere. If you have sharp eyes you might see the rocket's fiery jet overhead, tiny against the sky, like a distant star. Then it disappears into space and you wonder how far it will go.

Below, the ship's tracking radars follow the flight. Flash-timing throughout the ship synchronizes cameras grinding away on recording devices. All voice circuits, too, are recorded on special sound tracks. Plotting rooms bustle with charting operations. Saucer-shaped telemetering antennas are gleaning scientific and operational information from the rocket itself.

Released from the dense atmosphere, the Viking rips skyward at 3,500 miles an hour—almost a mile a second—before all fuel is consumed. Burnout occurs at about 75 seconds. The Viking keeps on climbing.

Booting into the ionosphere, the rocket scrapes the gates of outer space and hits 106.4 miles, more than doubling previous records of the Viking rockets. Then it starts down. There are two splashes seven miles astern and you hear the thunder of shock waves generated when the Viking re-entered the atmosphere. Less than 10 minutes have passed since the rocket roared off the *Norton Sound*'s launching deck.

During that 10 minutes the Viking shattered records. It went higher than any previous American designed and built single-stage rocket. It was the most spectacular and successful rocket firing from a ship

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under way at sea. And it confirmed the theory that ships can provide mobile platforms that extend the range of guided missiles far beyond limits imposed by land-based launchings.

But how was this record-breaking rocket handled and fired? What new developments and techniques make it one of the outstanding accomplishments of the year?

It is not simple, even ashore, to launch a huge missile fueled by liquid oxygen and alcohol. At sea, it is more complicated. The unprecedented flight was made possible by design improvements of the rocket itself and highly developed skill on the part of missile men—that new brand of pioneers who launch, control, and track fire-snorting rockets and missiles.

Viking Four, produced by Glenn L. Martin Company and powered by Reaction Motors, made its record flight despite carrying more than 900 pounds, the heaviest payload of any Viking. It had more than six cubic feet of added payload space below its pressurized nose cone. In addition, the body of the nearly 50-foot pencil-like Viking's tail section was structurally strengthened to withstand the stress of launching from the deck of a rolling, pitching ship. Electrical circuits were housed outside the rocket's body, and extra propellant space compensated for the aerodynamic drag of outside ducts. These propellants, used after the rocket had achieved ultrasonic speed, gave added boost.

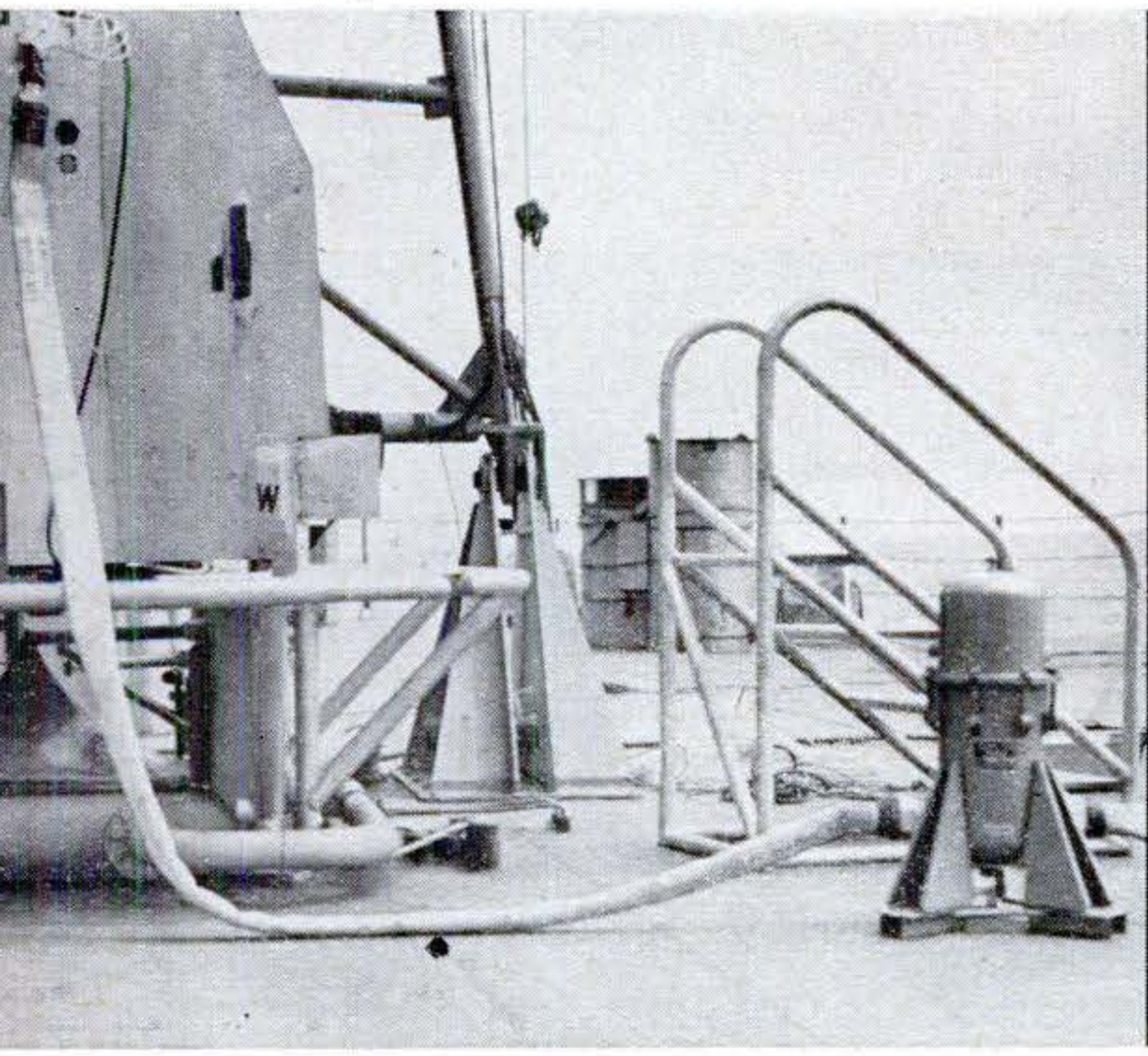
Oxygen tanks were built directly into the skin of the Viking, saving about 40 pounds of weight and gaining oxygen space, both important factors of rocket design. Other rockets have had separate insulated tanks.

Because aluminum is stronger under conditions of intense cold, the liquid-oxygen tank could be more lightly built than the alcohol tank, another weight-saving trick. Designers also saved pounds by tapering the outer skin of the oxygen tank in accordance with the distribution of the flight load.

For launching the giant rocket from a wave-tossed ship, a special upright launching system was designed. During land-based launching the rocket stands on its tail fins without added support. The *Norton Sound*'s frictionless launching device kept the Viking upright during preparations.

Although the *Norton Sound*'s afterdeck is strengthened and insulated against the terrific heat generated in guided-missile and rocket launching, Viking Four called for even more protection for the ship. A new flared pyramid deflected the rocket tail's violent orange-blue-red jet from the ship's deck on take-off. A stream of water sprayed inside the steel pyramid while four streams cooled its seared outside.

Special remote-control fire monitors were ready to serve as robot firemen in case of



The mighty Viking gets ready to drink a heady highball. The alcohol hose has been scrupulously cleaned, and the fuel passes through filter at lower right to eliminate impurities.

Hydrogen peroxide, another ingredient for the drink that will give the rocket its boost, is unstable, and handled with care. Pull of a pin can dump the ship's supply overboard in a hurry.

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fire around the rocket. Missile men were particularly careful in handling highly combustible rocket propellants. The hydrogen peroxide—far stronger than any you might buy in a drugstore—could have been dumped overboard simply by pulling a pin.

Liquid oxygen was stowed below decks in giant, insulated, spherical containers. Capable of maintaining oxygen in a liquid state at −290° F or less, they are the world's largest seagoing Thermos bottles.

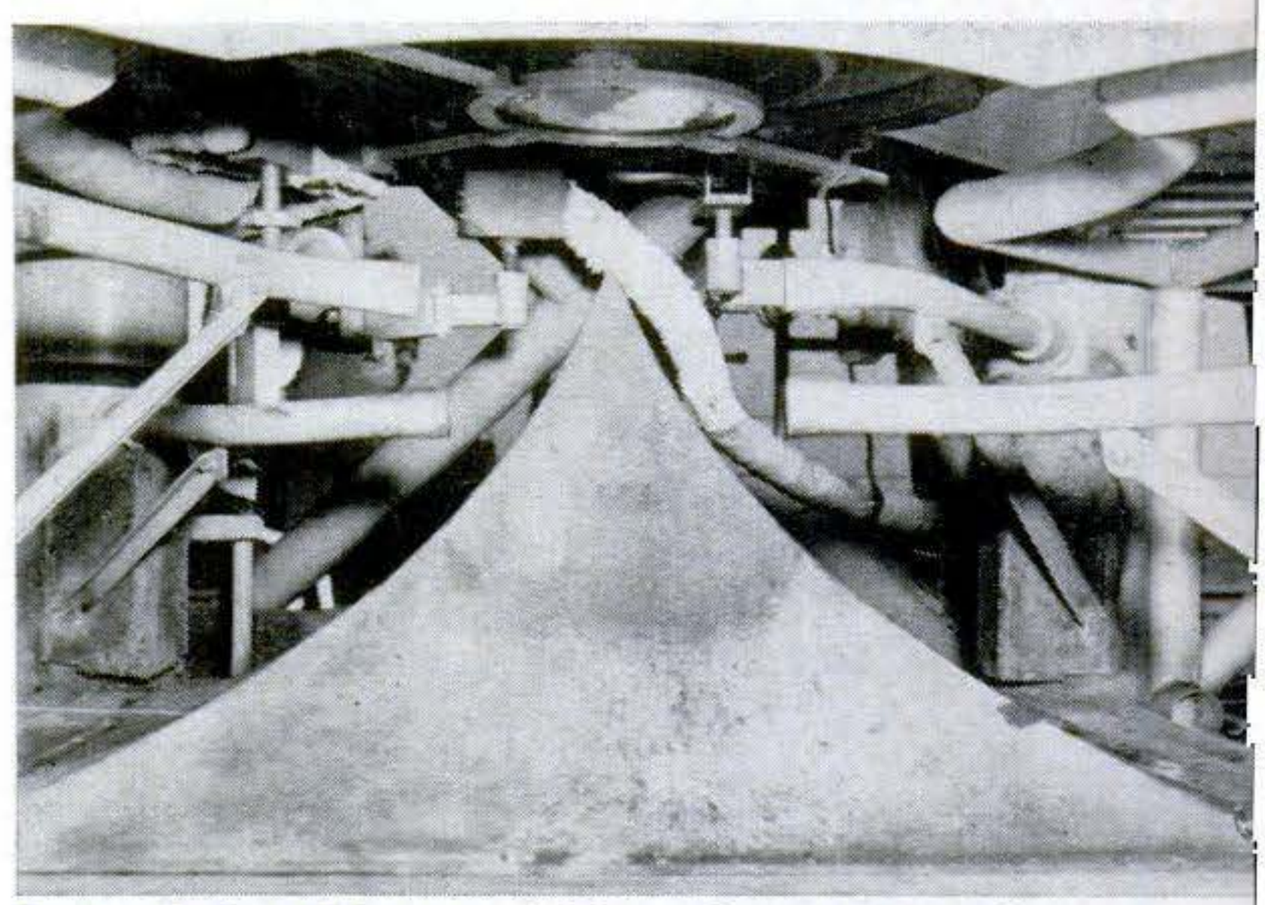
The missile men used a strange service station—a special tower framework with movable working platforms—for rocket fueling in final preparations. When final tests and fueling were completed, they lowered the tower to the deck clear of the rocket.

The tower also served as a lifting boom. The rocket was wheeled into position on a Barr cart, a special three-wheeled rocket vehicle. Heaved upward, the Viking rose into position nose first, and as the front wheel of the tricycle came off, the rocket's tail section continued to ride the rear wheels of the cart. Finally brought fully upright, the rocket was secured, missile men removed rear wheels, and the rocket was ready for servicing.

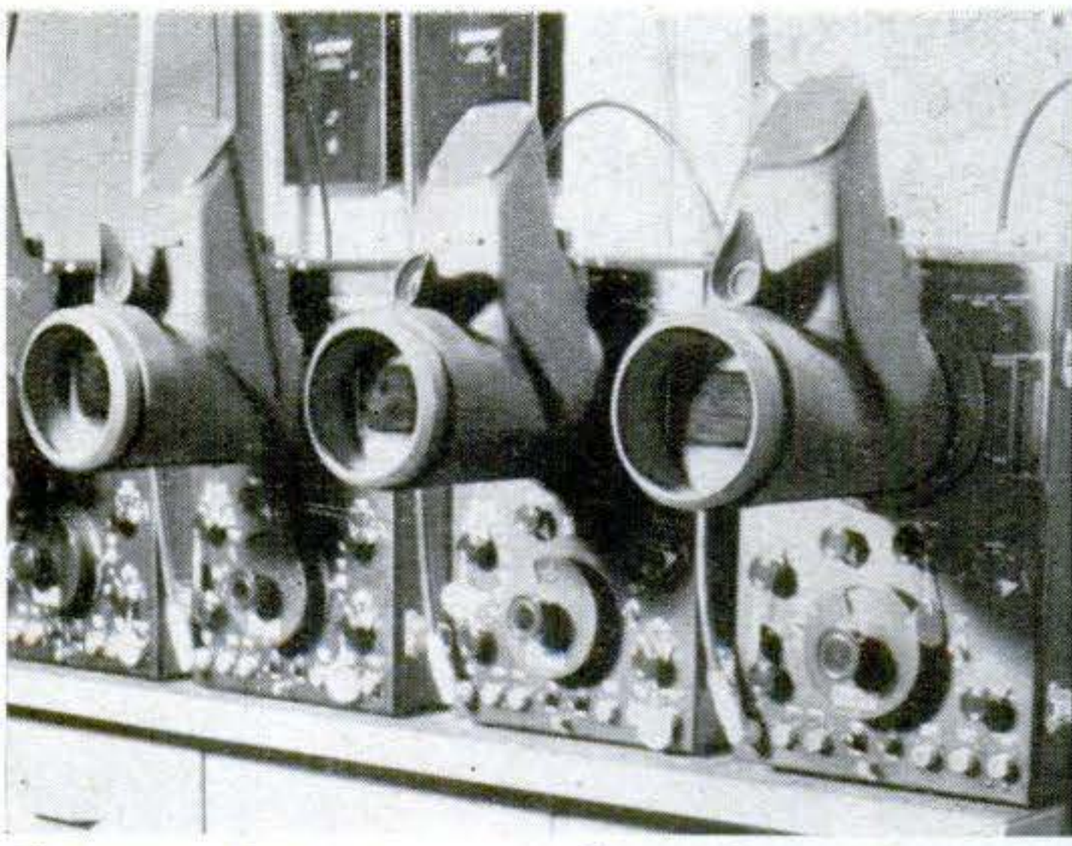
The rocket was kept sealed to avoid dampness and impurities. All electrical circuits were waterproofed again just before firing to avoid trouble from vaporization during flight. A rubberized "raincoat" kept off salt spray and rain.

No baby ever got more tender care than a mammoth Viking gets from missile men—and what a baby! When her lusty voice roars, Papa can't help listening. END

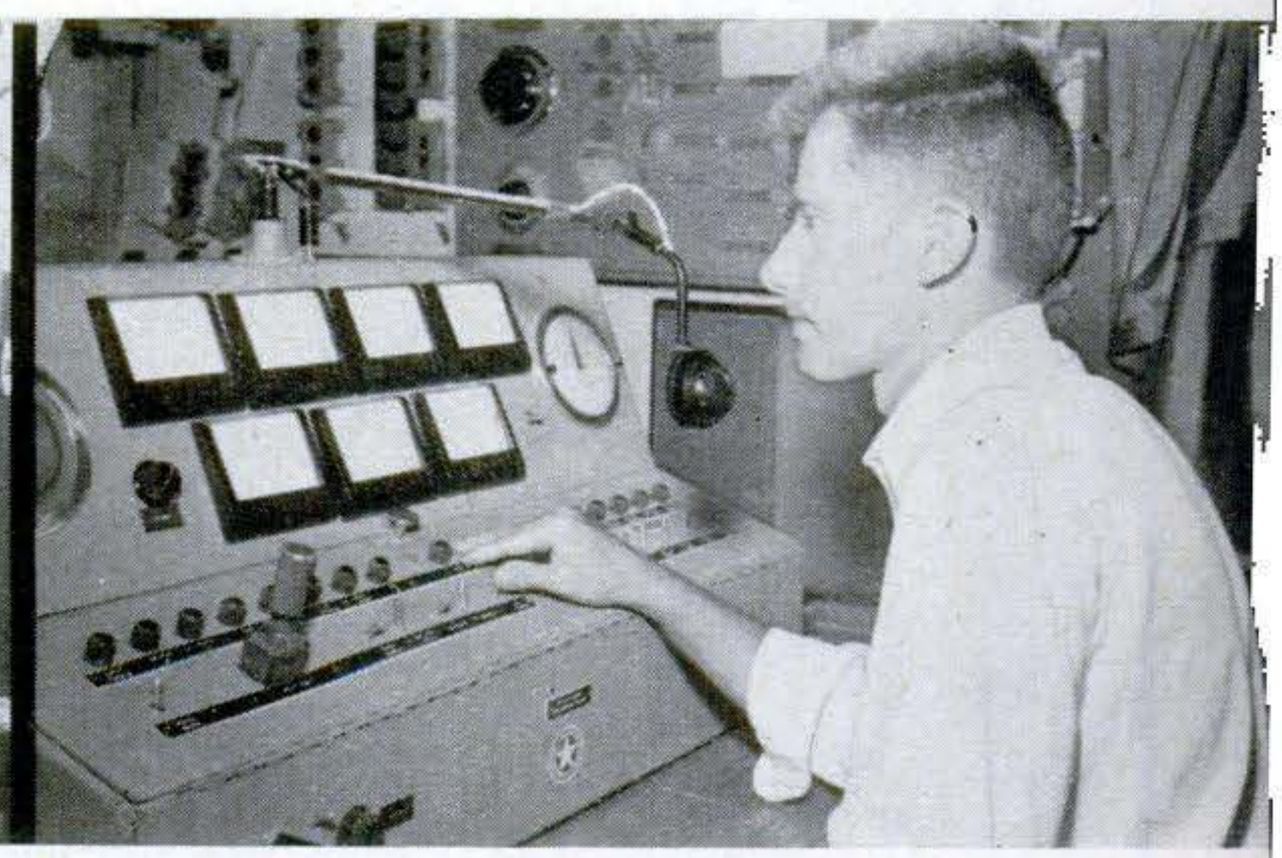
Robot firemen give the launching deck a trial spray as the *Norton Sound*, the Navy's experimental guided-missile ship, speeds toward the firing site on the equator, near Christmas Island.



Rocket's hot blast would have been too much for even insulated deck of ship. Water-cooled pyramid above deflected tail jet on firing, created steam clouds seen in photo on page 85.



Camera adapters, mounted on telemetering oscilloscopes, made a full pictorial record of the Viking's coded messages transmitted during its more-than-100-mile-flight into the ionosphere.



When big moment came, this push button in the control room triggered the rocket-firing mechanism. When it is pushed for next launching, Navy expects rocket to go twice as high.

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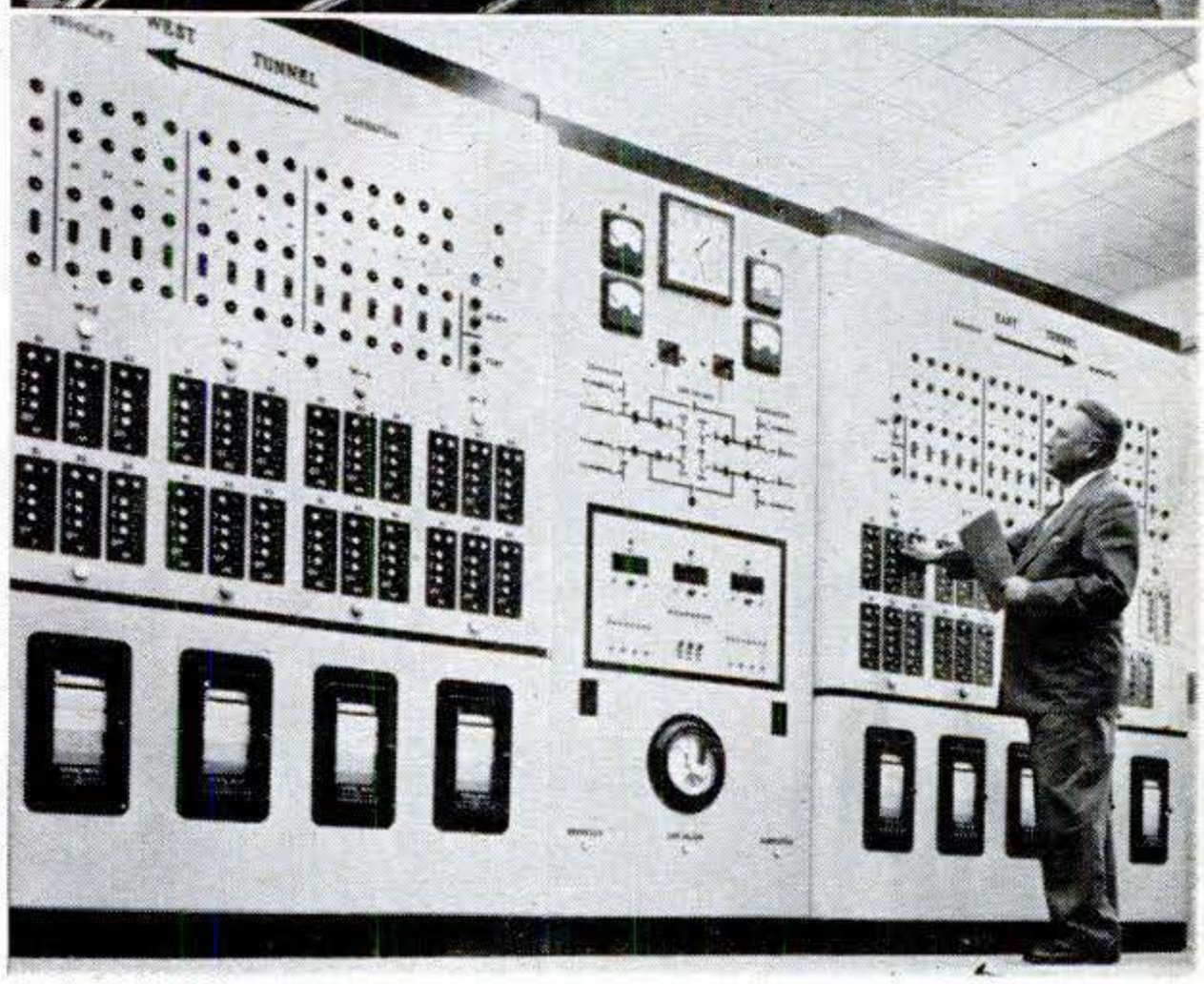
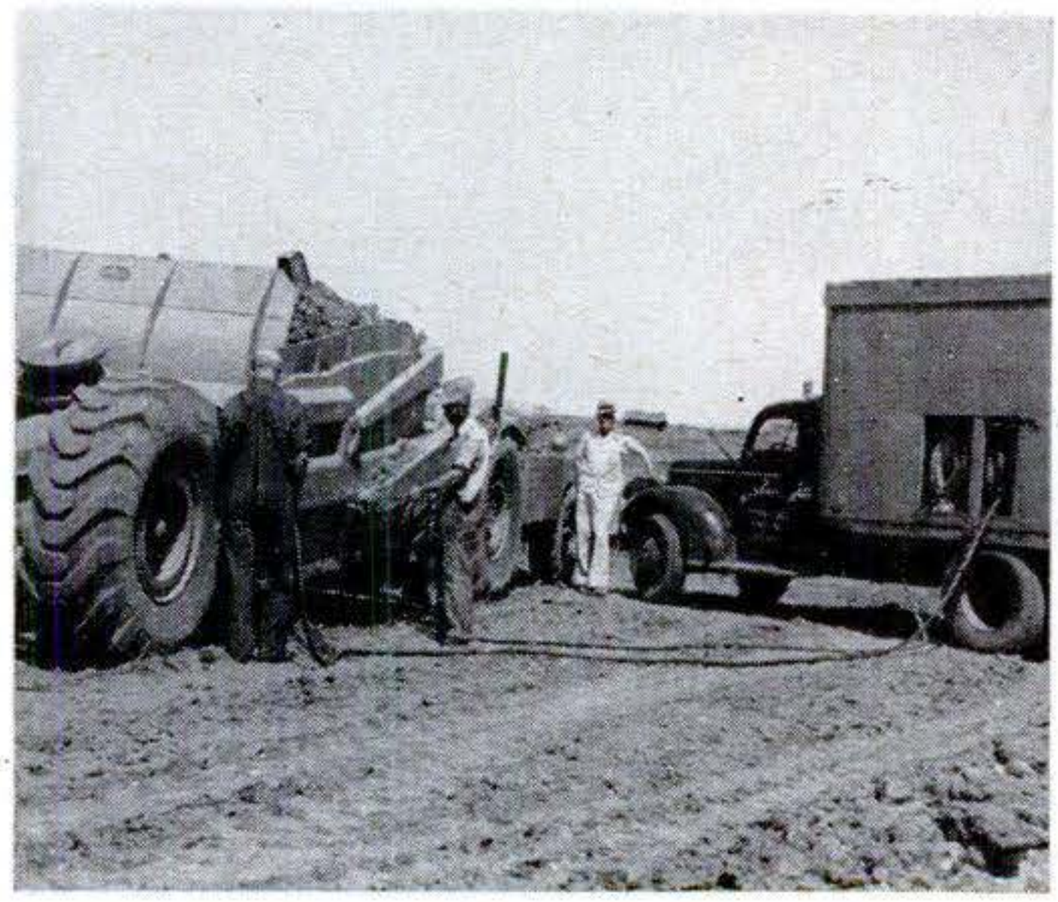
Luminous Ribbons Light New Tunnel

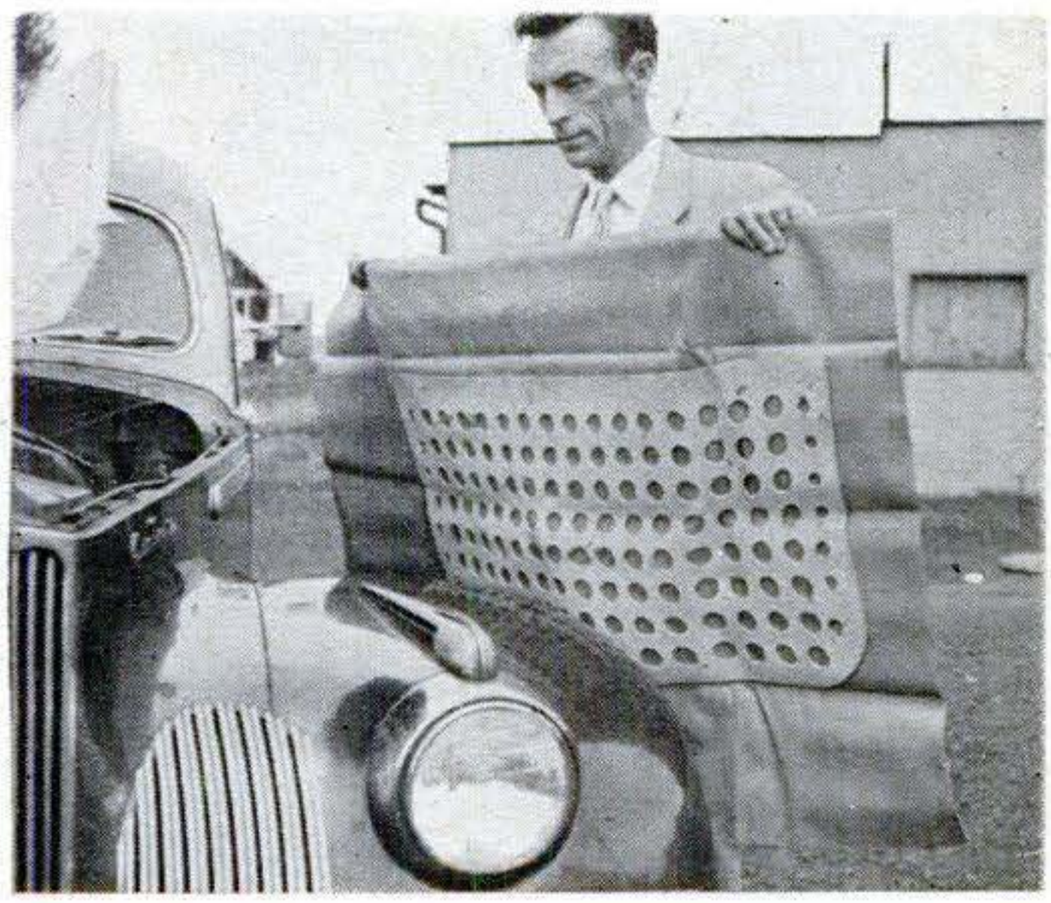
EXTENDING almost two miles, four luminous ribbons form the world's longest continuous lighting system, in New York's newly opened Brooklyn-Battery Tunnel. Pyrex pipes containing 5,776 individual fluorescent lamps provide glareless illumination, as seen in upper view at right. Longest under water of all vehicular tunnels, and second longest from portal to portal, the new 9,117-foot twin-tube tunnel employs more than 1,700 miles of wire in its GE-installed electrical system. Operators at its main control panel (lower view, right) watch carbon monoxide indicators and regulate ventilating fans or vehicle flow accordingly. Electrical equipment includes photo-electric height gauges, at tunnel entrances, that sound an alarm and turn traffic lights red against vehicles too tall to pass safely through.





Service Station Rolls to Work

A LUBRICATING truck built by a Sedalia, Mo., construction company has solved the problem of servicing its fast-moving, heavy-duty machinery out on the job. Hoses on reels, as seen above, supply oil and grease from 55-gallon drums and air from a pressure tank. A compressor driven by a power take-off provides the air pressure. The mobile service station also supplies water, from a valve just behind the cab.



Repair Pad Guards Fender

SHINY fenders won't be marred by car tools when they're protected by a cover called the Mechanic's Pal, above, for use in repair garages or by the car owner who does his own tinkering. A foam-rubber base keeps the pad from slipping off a fender, and forms a cushion on which tools may be laid. The wear-resistant vinyl fabric is reported proof against gasoline, grease, water, and acid.

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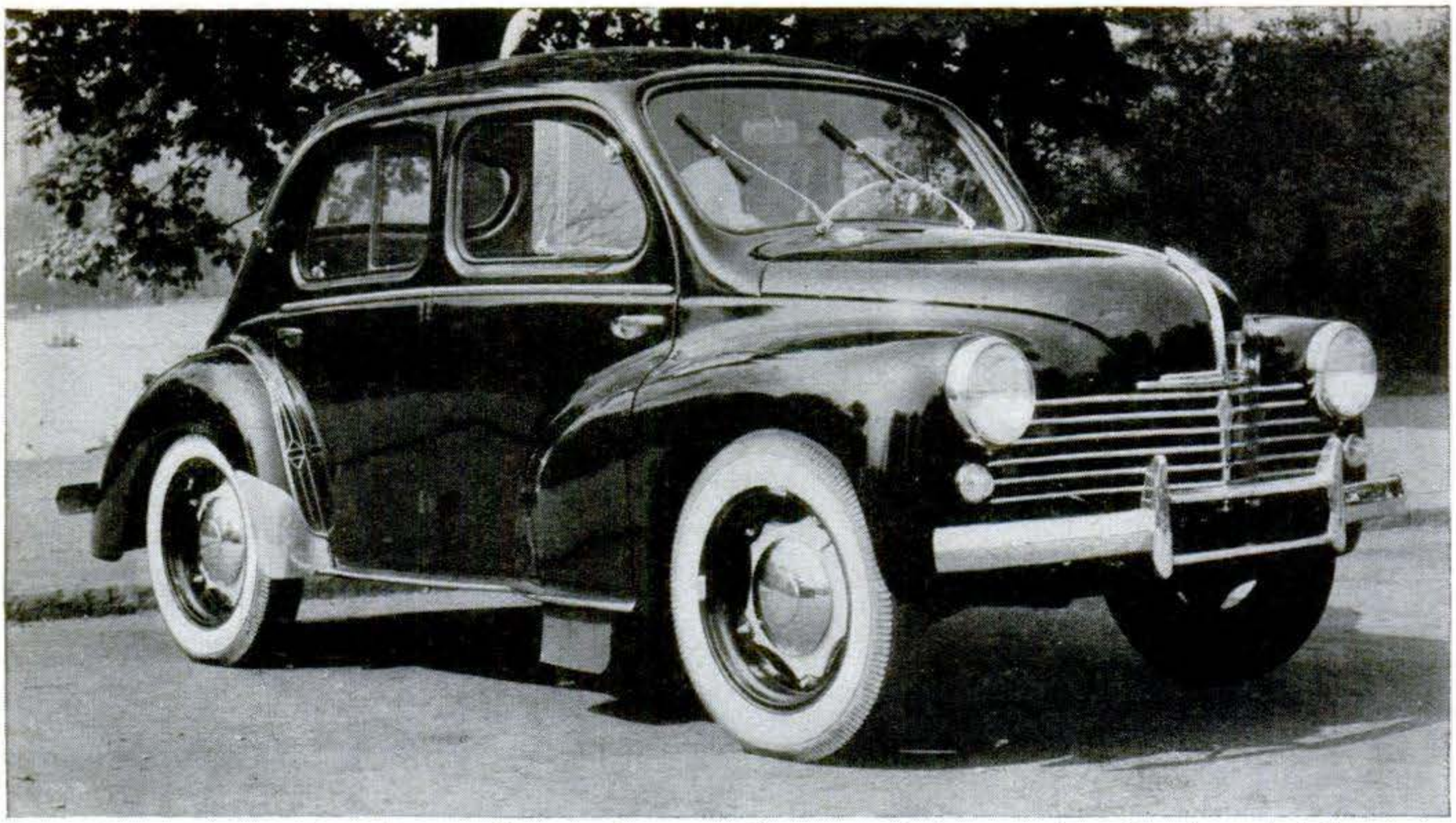
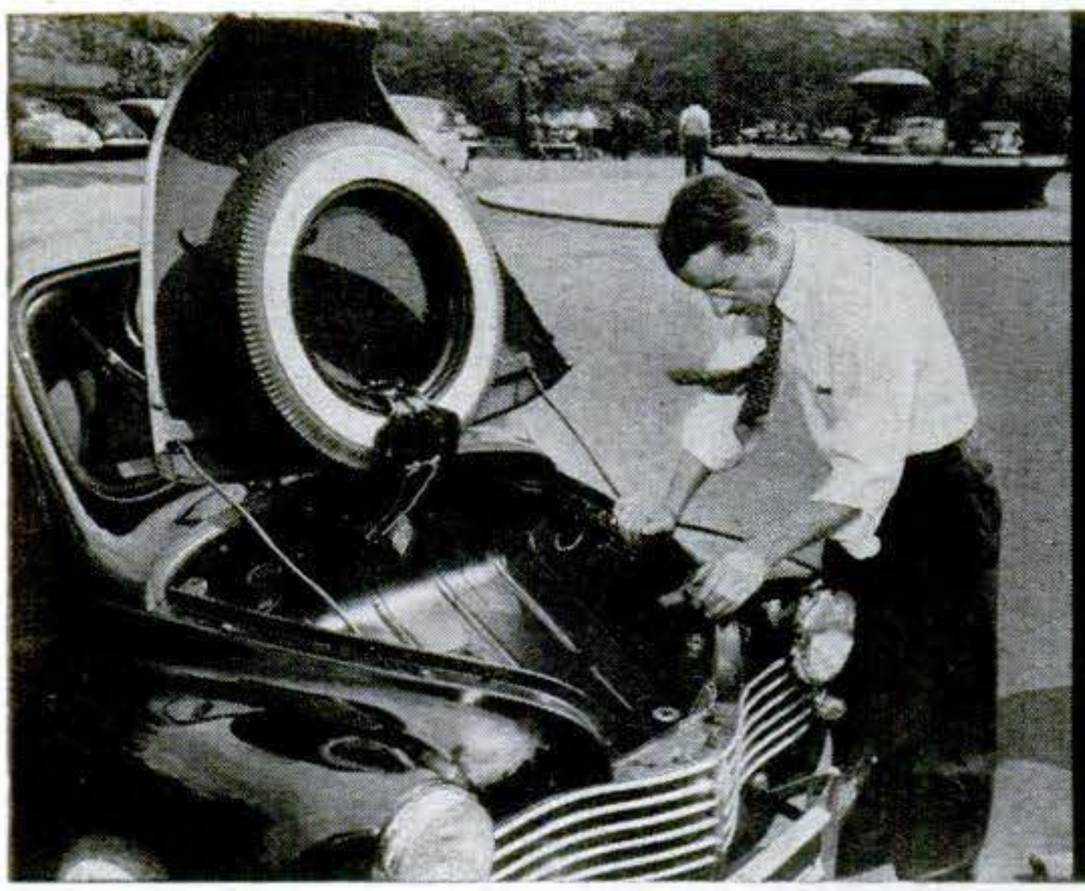
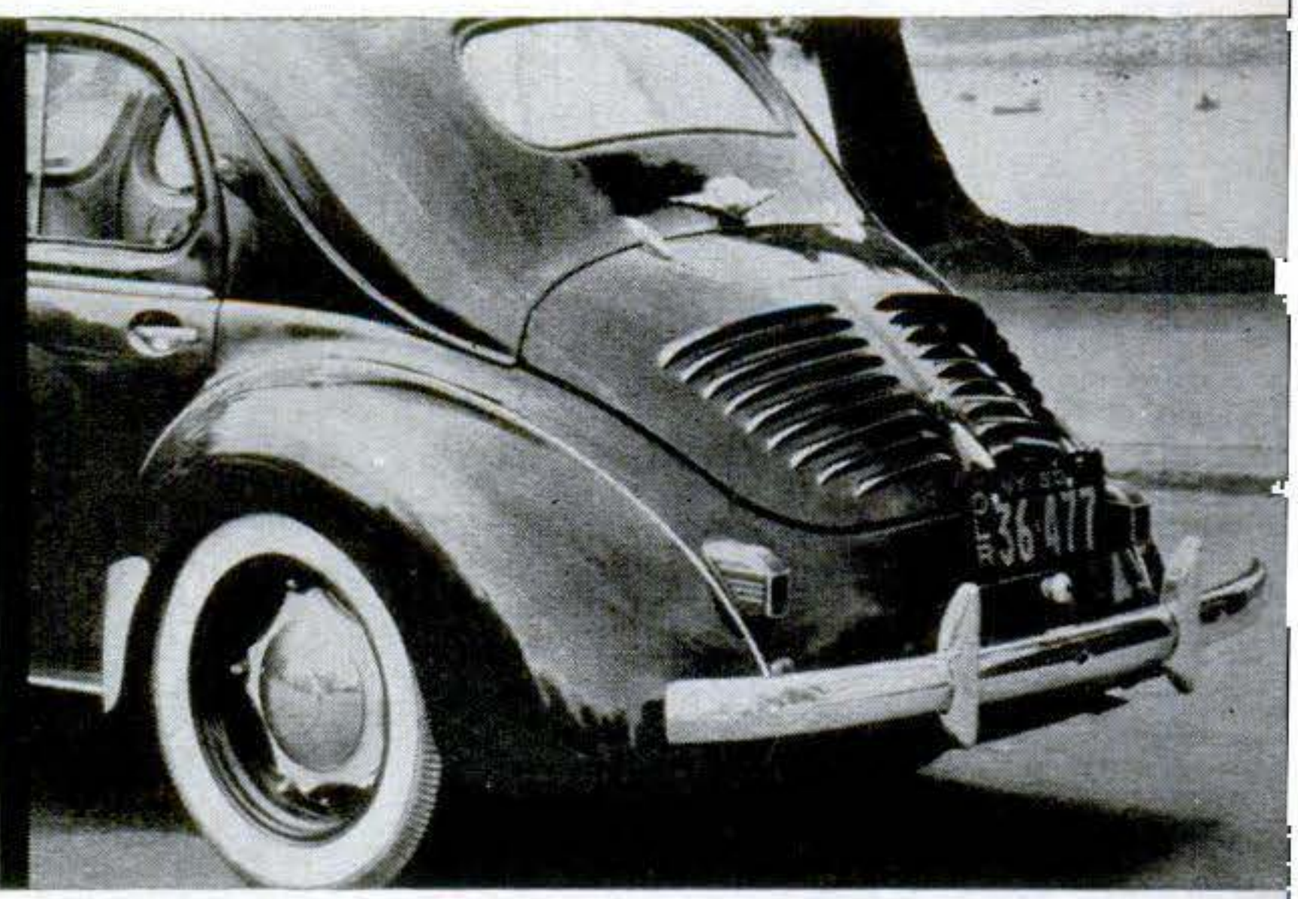


New de luxe model has white-wall tires, chrome grille over engine air inlets on rear fenders, and better upholstery. It sells for slightly more than the $1,095 charged for basic model.



Front compartment carries spare tire, 6-volt battery, tools, and small amount of luggage. To top off brakes, fluid is poured into reservoir indicated here. Floor slopes to increase leg room.



Rear engine pushes 1,200-pound midget. Car is 56 inches high, 56 wide, and 141½ long on an 83-inch wheelbase. Note turn light behind rear door, radiator cap above engine cover.

Renault Engine Easy to Get At

By R. P. Stevenson

PS PHOTOS BY HUBERT LUCKETT

FOR BACK-YARD mechanics, the little Renault is a dream come true. In designing it, the French manufacturers emphasized easy access for servicing and repairs. Its four-cylinder, overhead-valve engine rides in what would be the trunk compartment of a standard American car. Everything's within easy reach and there's plenty of work space.

When time comes for an engine overhaul, you can remove the cylinder head (which is aluminum, with tool-steel valve inserts) and simply lift out the wet cyl-

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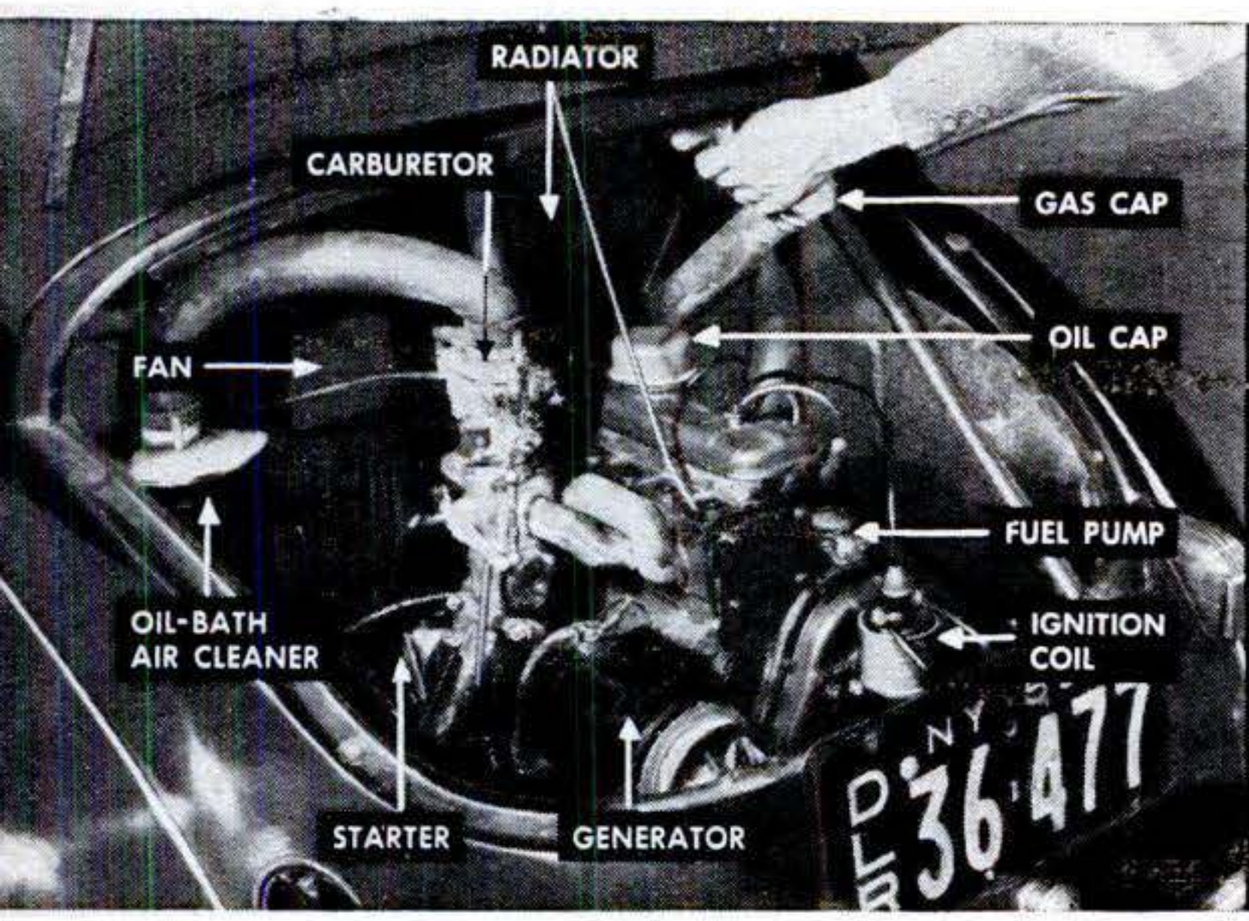
Cockpit controls are unconventional. Lever at base of gear shift is the choke control. Other one behind hand brake is the starter. Cushion was removed to show package space under it.

Steering-column lever blows horn and turns on lights. Besides this, there's a low-high beam button on floor. The wipers operate electrically, and speedometer includes trip indicator.



Engine and accessories are all easy to reach and a built-in light lets you see them. The four-cylinder engine has a 2.17-inch bore, a 3.15-inch stroke, 46.3-cu.-in. displacement.

Rim detaches from center of wheel when you change the 5.00 by 15 tires, a standard U. S. size. Brakes are hydraulic. Car has coil springs, sway stabilizer, and hydraulic shocks.

inder sleeves. Crawl under and take off the crankcase, and you can then pull out the pistons and con rods—also from above.

If the need arises, you can jack up the car and remove the engine, radiator, clutch, transmission, and rear-axle assembly as a single unit. Power is carried to the rear wheels through Cardan (universal) joints. This makes possible independent suspension of the rear wheels.

In its 1950 model, Renault is introducing a more powerful engine. Compression has been upped from 6.7-to-1 to 7.5, and the engine now yields 22 hp. instead of the previous 19. For the first time this year, a de luxe model also is offered, but this adds only a few luxury frills to the standard four-door, four-passenger sedan.

Economy is the keynote. A Renault does about 45 miles on a gallon of gas. The standard model sells in the U. S. for $1,095 plus transportation costs and local taxes.

The Renault is equipped with a standard three-speed transmission. Top speed is somewhere over 60 m.p.h, and the car cruises nicely at 50. END

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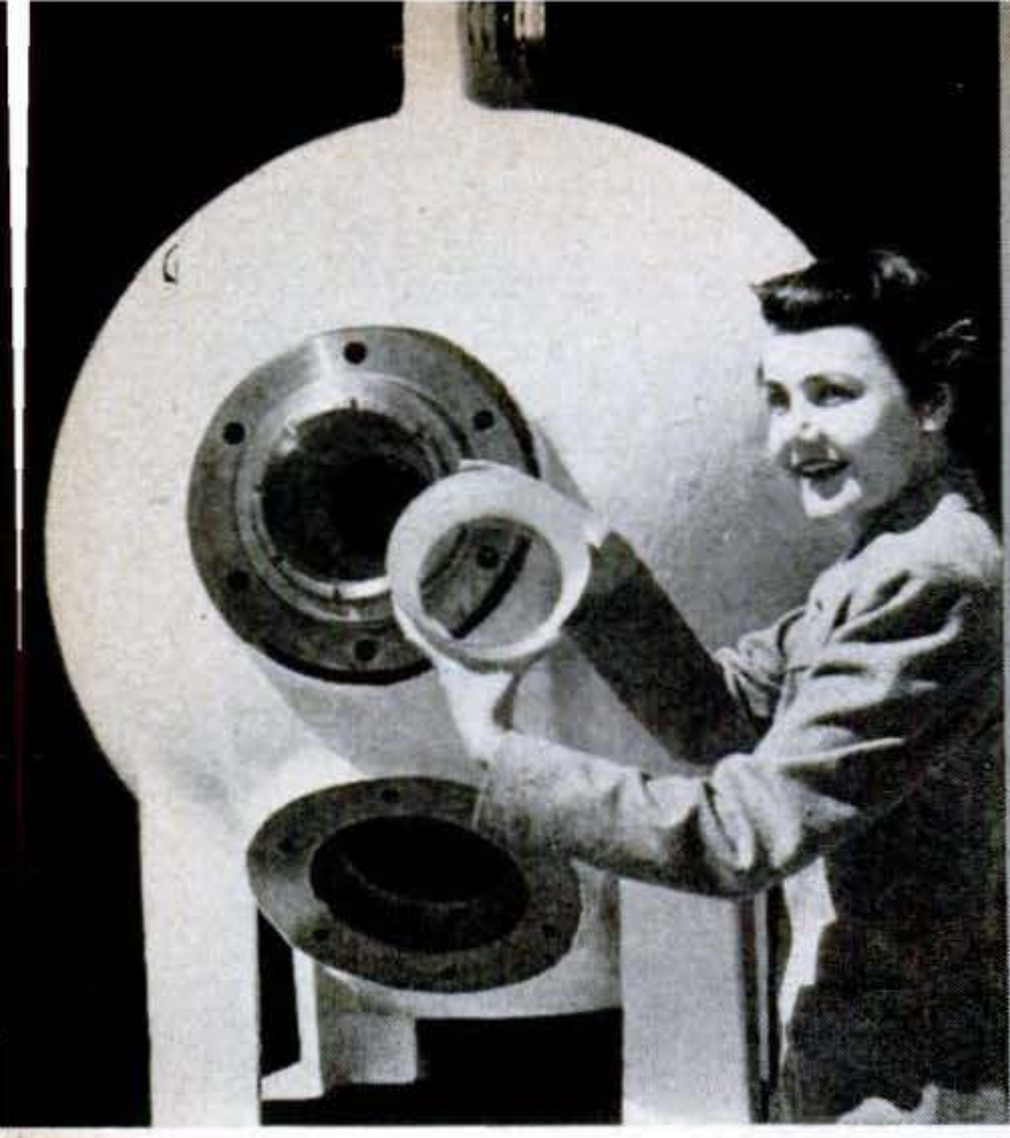
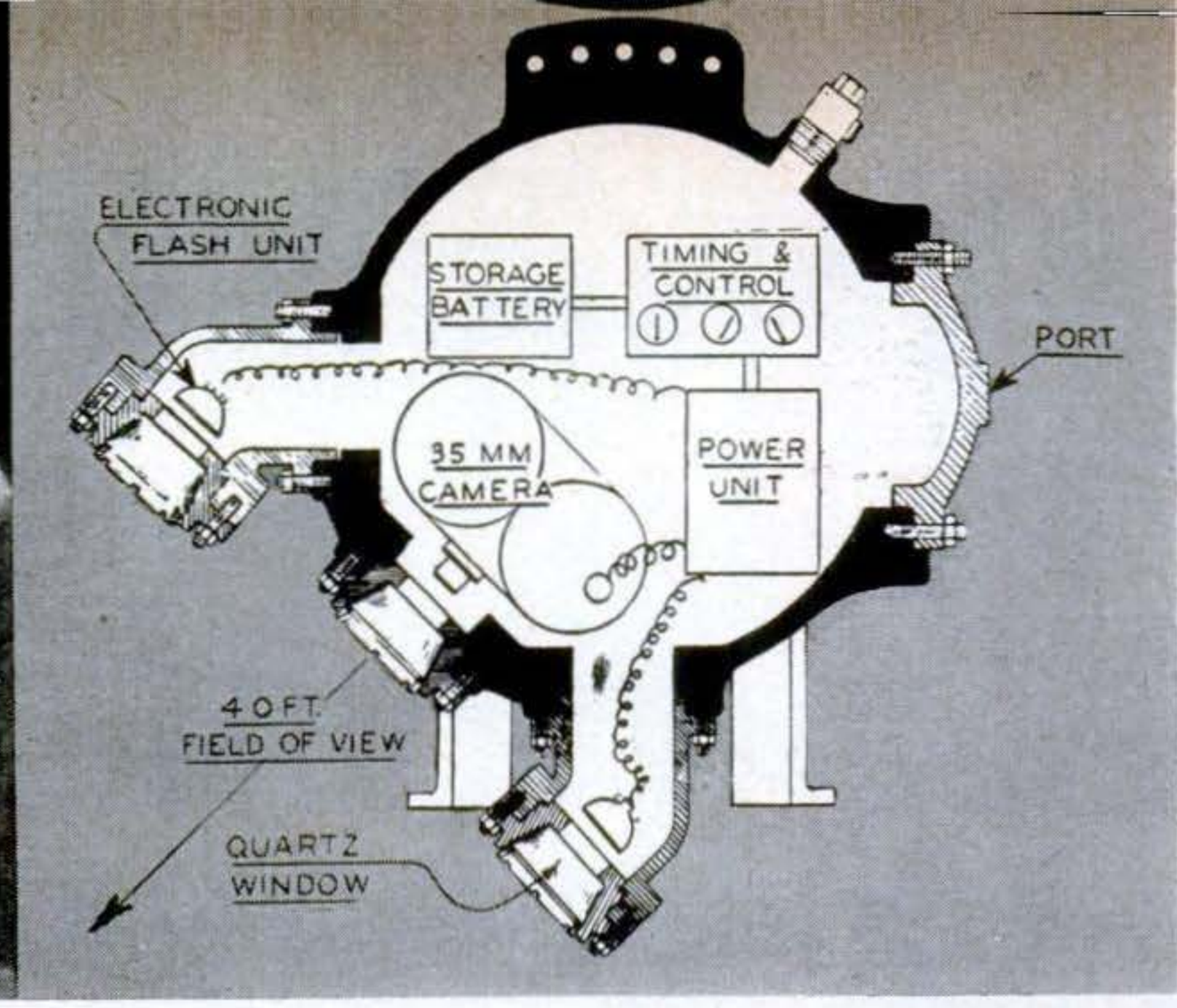
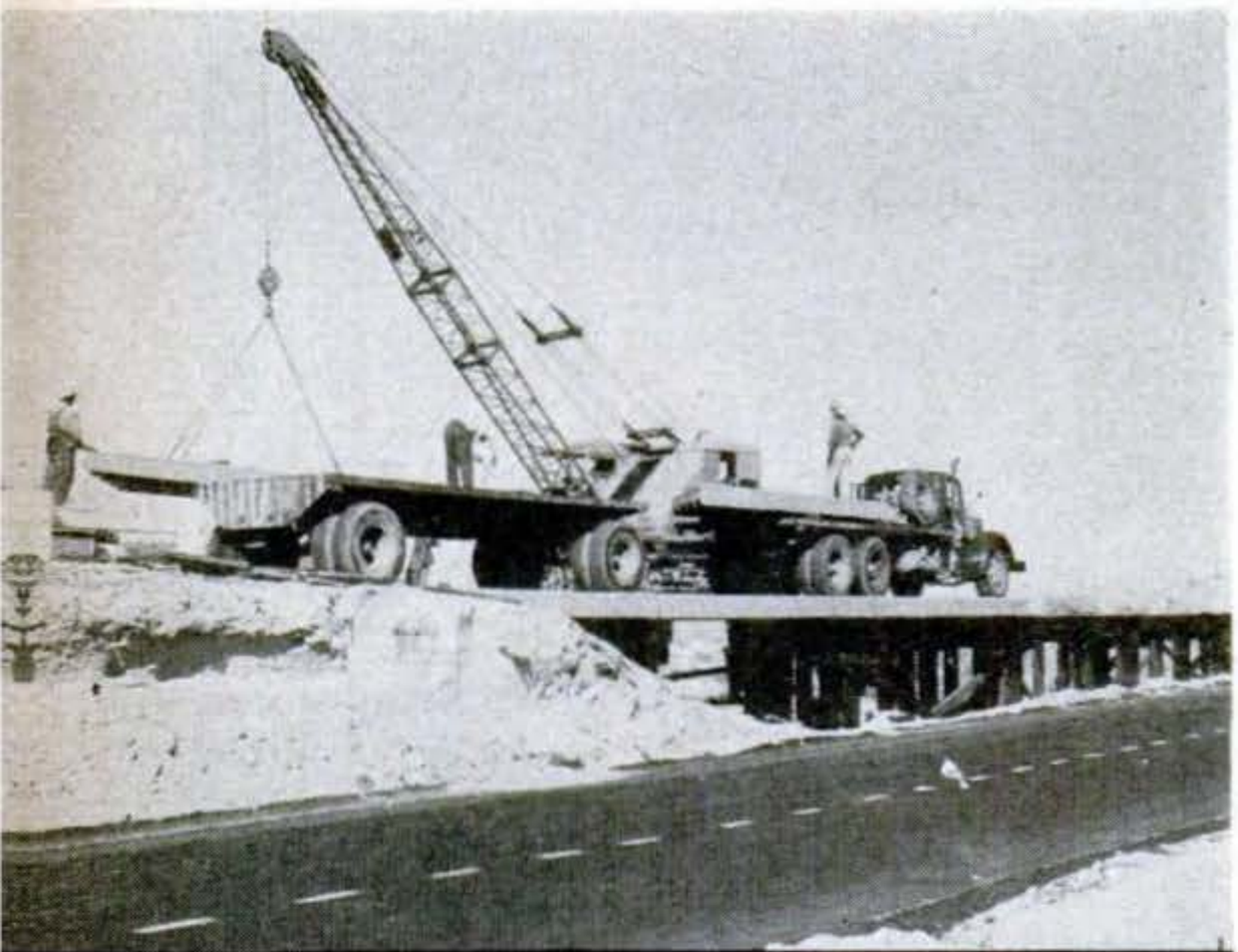




Camera to Explore Deep Seas

HERE'S a baby brother to the diving bell that carried Otis Barton 4,500 feet down into the Pacific last August (PS, Oct. '49, p. 166). The 3,000-pound, unmanned ball is 39 inches in diameter. Its cast-steel shell, 1½ inches thick, can withstand pressures of over 5,000 pounds per square inch at depths of 12,000 feet. Fused quartz windows, like one held by girl at left above, are seven inches in diameter and three inches thick. Two stroboscopic flashers provide light for a 35-mm. camera to shoot 800 frames at the rate of 12 a minute. Power supply, timing devices, and measuring instruments take up the remaining room, as shown in cross-section view. New sensitive orthicon pickup tubes may make it possible to televise luminescent sea life by its own light. A camera then would record the scene by focusing on a TV screen inside the benthograph. The ball has been designed for deep-sea photography by Dr. Maurice Nelles of the Allan Hancock Foundation at the University of Southern California.

Steel Deck Panels Speed Bridge Building



A NEW type of bridge construction uses prefabricated steel panels for the roadbed instead of planking or concrete. Three-ton sections are shown at left being swung into position from a truck during construction of a bridge at Smoky Gulch, Calif. Panels (lower left) can be made in any shape, and can easily be replaced when worn or warped. Load-bearing capacity is increased by cross-plates on the underside. Finished bridge (below) awaits blacktop surfacing and guardrails, but can carry traffic as soon as panels are bolted together. The system was designed by the California State Highway Dept. and developed by Bethlehem Pacific Coast Steel Corp.

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Typewriter with a Memory "Sets Type" on Photo Film

With electronic calculators, relay grids, and a flashing strobe light, supertypewriter makes cast type unnecessary.

DRAWINGS BY RAY PIOCH

MOVABLE type, Gutenberg's 15th Century brain wave that makes printing possible, is threatened with obsolescence by a system combining the sciences of electronics and photography—with a bit of almost-human judgment thrown in.

Movable type, which put an end to the hand-copying of manuscripts, made the printed word one of the most potent means of communication man has. Technically, though, type is a slow, clumsy, and costly method of doing the job. Conventional type came close to the end of its technological rope more than half a century ago, when the Linotype machine was developed. This device made possible the mechanical casting of type by lines, superseding letter-by-letter hand composition. This advance, along with the change from wood to metal slugs, is one of the few fundamental improvements in the art since the printer put the manuscript copyist out of work.

Recently, research in the graphic arts has been seeking *[Text continued on page 96]*

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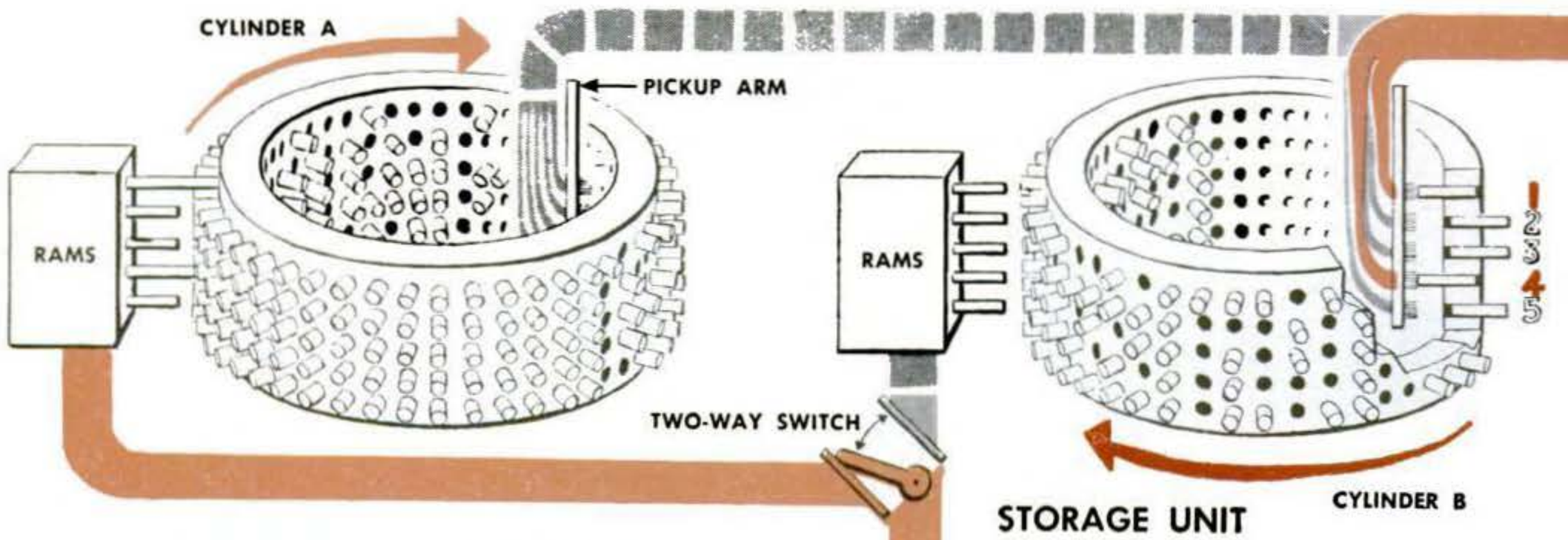
How Photo-Printer "Remembers" Line, Spaces

1 Typist taps out copy on electric typewriter with standard keyboard. Each character has a two-digit code number—for instance, 1-4 for capital S. Hitting key sends signal that actuates first and fourth of five rams alongside cylinder A in storage unit below. Rams push in pins 1 and 4 in one of several vertical rows of five pins each around cylinder. As successive keys are hit, cylinder turns slowly. Codes for a complete line are thus stored in successive rows of pins before signals are sent on to photo projector at bottom of opposite page. This lets typist backtrack and make corrections, if necessary, after proofreading what is written before it is projected on film. Meantime, previous line —stored on cylinder B—is being transmitted to projector. Two-way switch alternates cylinders as typewriter carriage is flipped back to start a new line. (Drawing on these pages is a simplified schematic diagram of the actual photo-composing machine, which has seven rams for each cylinder and seven pins in each row to provide enough code combinations for the 80-odd characters in a type font.) Indicator beside typist, showing how much space in line is used and how much left, guides typist in stopping as line nears its upper limit. Character and space counters feed data to justifier mechanism, a computer that automatically distributes unused space between words, so line will come out even on right-hand side when it is projected on film. Visual indicator under glass at typist's right tells when line is in justification range and also shows previously composed lines.



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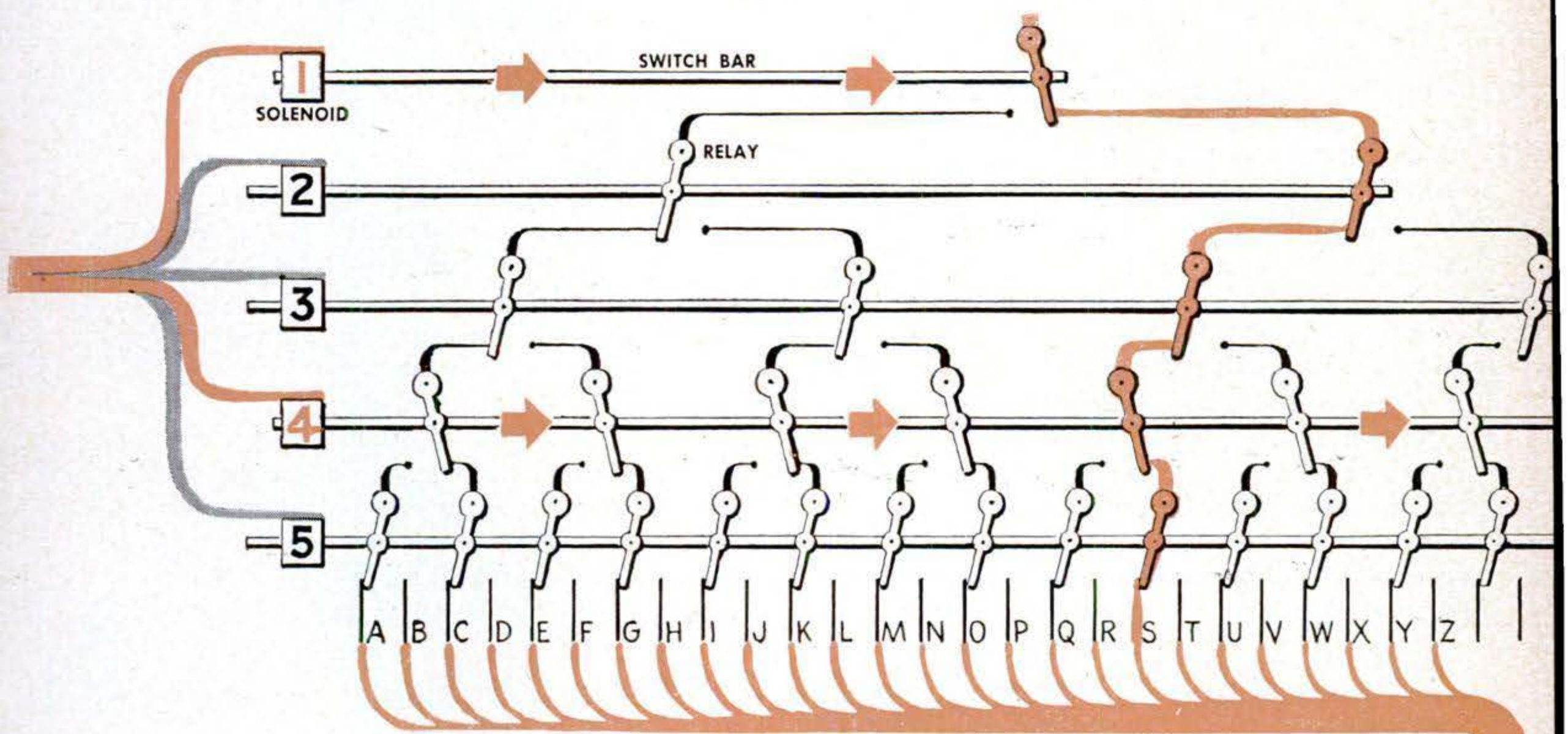
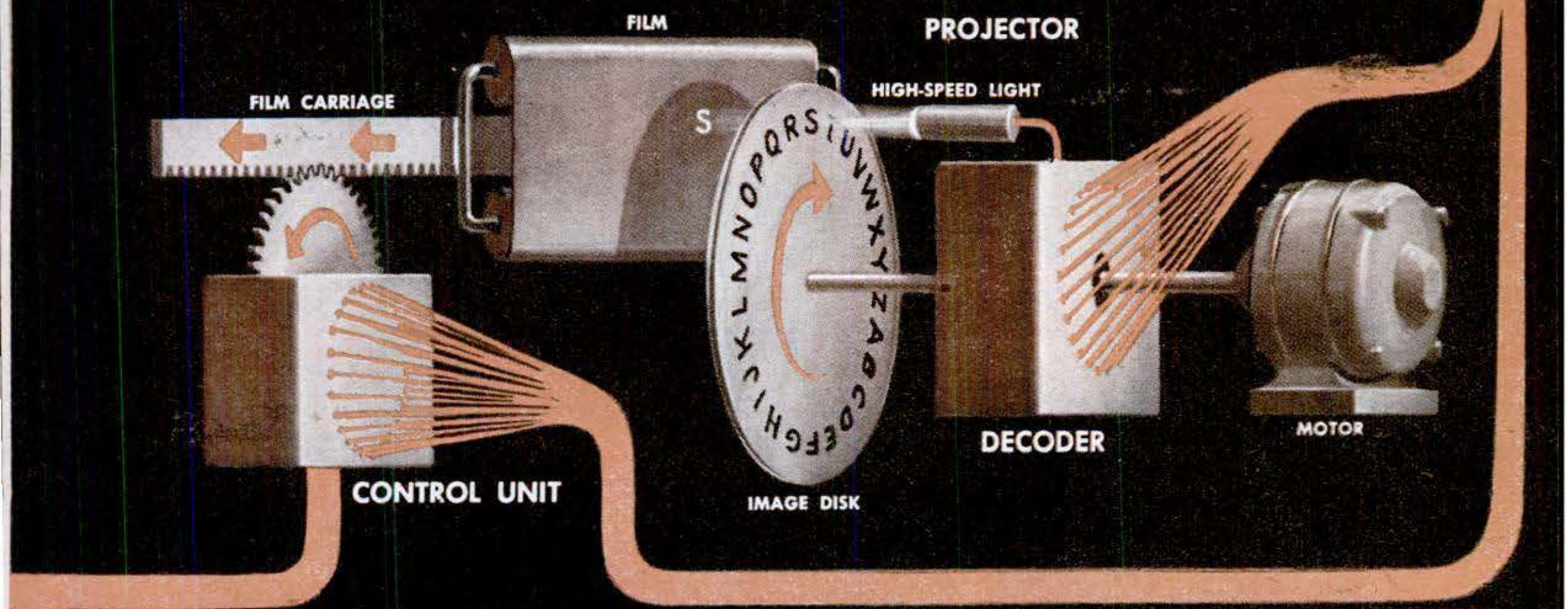
It Accurately, and Flashes It Onto Film

2 As cylinder B rotates, code signals for stored-up line of print are picked up from protruding pins by five brushes spaced along an arm that wipes its inner surface. Each brush is connected to one of five solenoids (below), numbered to correspond with rams and rows of pins. Solenoids switch telephone-type relays along bars extending to right. All relay contacts remain toward left when solenoids are not actuated. When pickup arm brushes row of pins carrying code for capital S, actuating coils 1 and 4, solenoids push contacts of relays on bars 1 and 4 to right. This channels current to the correct lead to photo projector unit at bottom of page. While actual solenoid-relay network is more complex, it works on the same principle in translating pin-position code into electrical impulse to produce the desired letter. The system of solenoids and relays is engineered to work at high speed in selecting letters.



3 Leads from relays run to contacts on decoding drum around shaft of motor that turns a pickup arm and disk rimmed with images of letters. When pickup touches a live contact, high-speed flash lamp projects image of letter onto film. Lens system, not shown, can change size of letters. Other leads from relays go to carriage-control unit. This moves film carriage correct distance for width of letter. Separate signals to control unit from justifier, at its left, move carriage for space between words to fill out line. Machine positions letters with great accuracy.



to simplify type composition, with several goals in view: reduced costs, greater speed, greater flexibility, and better quality. Several potentially revolutionary methods have come over the horizon (PS, May '48, p. 107; April '49, p. 133).

Much of this work has been concentrated on photographic processes, in which the flat image of the letter can be substituted for three-dimensional type. Since printed matter exists in two dimensions, there is no more excuse for a three-dimensional approach than there is for a solid silhouette.

Typist Can Run It

With the introduction this summer of the prototype of one of the most promising photocomposing machines, the eventual triumph of shadow over substance and modern science over medieval ingenuity seems closer at hand than ever before. This machine is almost as automatic as a typewriter, and can be operated by a semi-skilled typist with scant chance of error. The machine is no bigger than an office desk.

The material to be "set" is typed on a standard electric typewriter in the center of the machine. The line appears on a roll of paper for examination and necessary corrections. If an error has been made, the carriage is moved to the point of error, a correction key is pressed, and the proper letter is inserted. The column width of the line has been set. Under glass at the right the typist sees a visual representation of the page being produced. As she types, a line creeps along toward the right margin to show how much space is left.

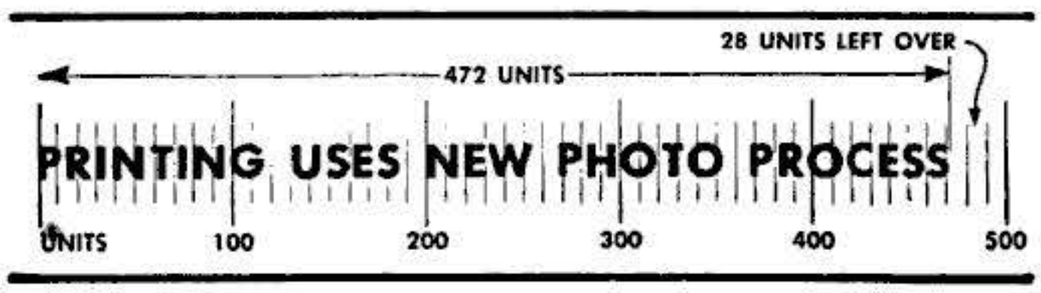
As each letter or symbol is struck, its identity and width is recorded within the machine, as are the spaces between words. But since the operator has stopped before filling the line, the characters and spaces typed fall short of the column width by some hundredths of an inch, the units in which the machine measures.

At this point the photocomposing machine gets smart. Having been instructed to proceed to record the line on film, after the operator has checked it for accuracy, the machine takes judicial notice of the fact that the line won't "justify"—extend out to the right-hand margin.

The mechanism has already noted the number of interword spaces, and it now "knows" how many units of space the line is short. If the number of spaces and units are the same, an electronic computer increases each space by a unit; if there are more units it divides them into slivers of a hundredth of an inch and adds them evenly to the spaces in the line. Except in cases

How Photocomposer Solves Spacing Problem

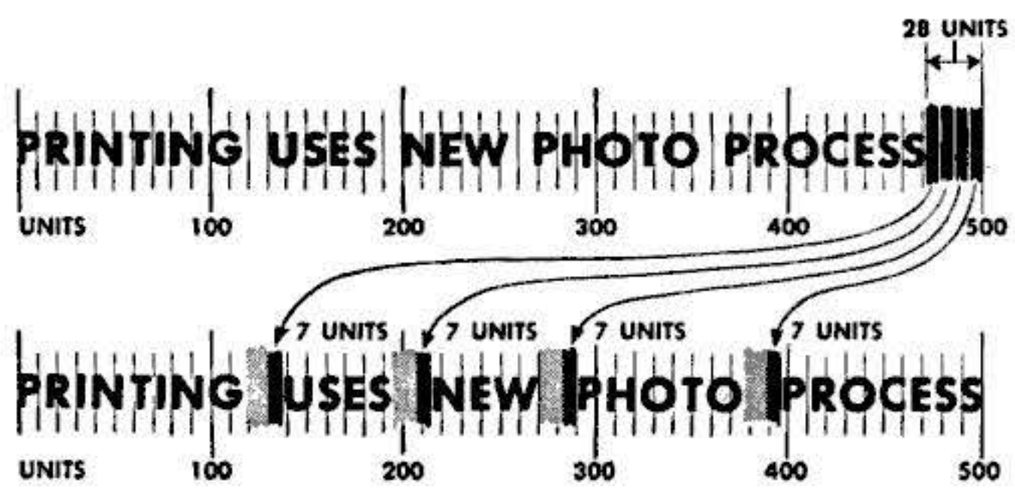
By electronic arithmetic, the new machine neatly allots space to make each line "justify" —come out even. Assume that here the typist has set the machine to make 500-unit lines. As each key is struck, the particular width of that character is noted. Besides keeping total of character widths, counter adds the nominal



space between words. An indicator by the typist continuously shows how many units remain unused in line. This lets typist stop at a word or word division as total nears 500 units. In the diagrammatic example above, the typist stops typing when the count reaches 472 units.

Another counter, meanwhile, has been noting and adding spaces between the words typed.

With the line provisionally finished, the two counters pass their information on to the justifier. Subtracting the character-width total from the over-all line length, an electronic computer determines that there are 28 units to be disposed of. It then divides this by the number of word



spaces (four, in this case), and apportions seven extra units to each word space, making the line come out exactly 500 units. If the division doesn't come out even, the line is spaced out unevenly in hundredth-inch units, so small you can't see the difference.

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involving very small column widths, this should eliminate such typeset lines as:

Jones said he stepped slowly t h r o u g h

which tend to leave the reader breathless.

With great rapidity the machine then puts the line on film, doing this while the subsequent line is being typed. Each character in the line, which has been stored up in one of a pair of "memory" cylinders, is identified by a decoder. The decoder is linked to the movement of a spinning glass disk, on which are arranged characters of the selected font, or variety, of type. If an "A" is wanted, as the letter comes into position the decoder triggers a strobe light that produces a two-millionths-of-a-second flash, recording the "A" image on the film.

At the same time other control devices supervise the movement of the film along behind the spinning disk. Though capable of great speed, they move so precisely that letters can be positioned within five ten-thousandths of an inch.

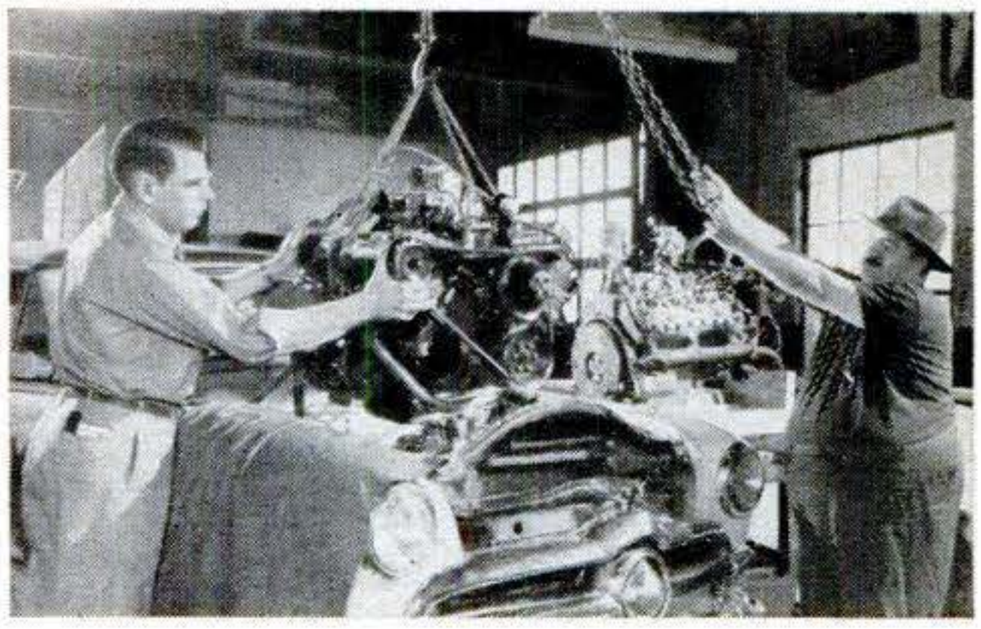
Use of an opaque character on a clear disk produces a photographic negative, suitable for use in engraving the final printing plate. To obtain a photographic positive, the elements would be reversed—an opaque disk with a clear character.

"Sets Type" Three Times as Fast

The photocomposer can "set type" three times as fast as mechanical line setters now in use, it is claimed. Definition of characters is noticeably sharper than those obtained from type—which is reasonable, since a beam of light can be more precisely controlled than hot metal in a mold.

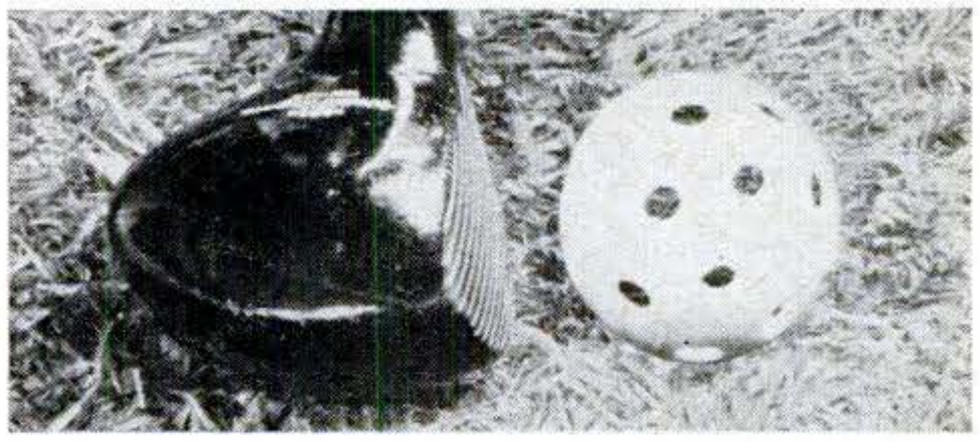
Advances planned for future models include use of a drum holding 20 fonts of type, any one of which can be selected by the turn of a dial; installation of a lens system to permit each font to be used in nine different sizes; automatic development of the film within the machine; and an automatic stripping device for rephotographing changes and corrections onto new film.

Invented by two French engineers, Rene A. Higonnet and Louis Moyroud, the photocomposer is being made under the sponsorship of the Lithomat Corporation, of Cambridge, Mass. The patents have been assigned to a nonprofit group, Graphic Arts Research Foundation, Inc., supported by a large number of publishers, which will undertake the development of this machine and other advances for the printing art. END



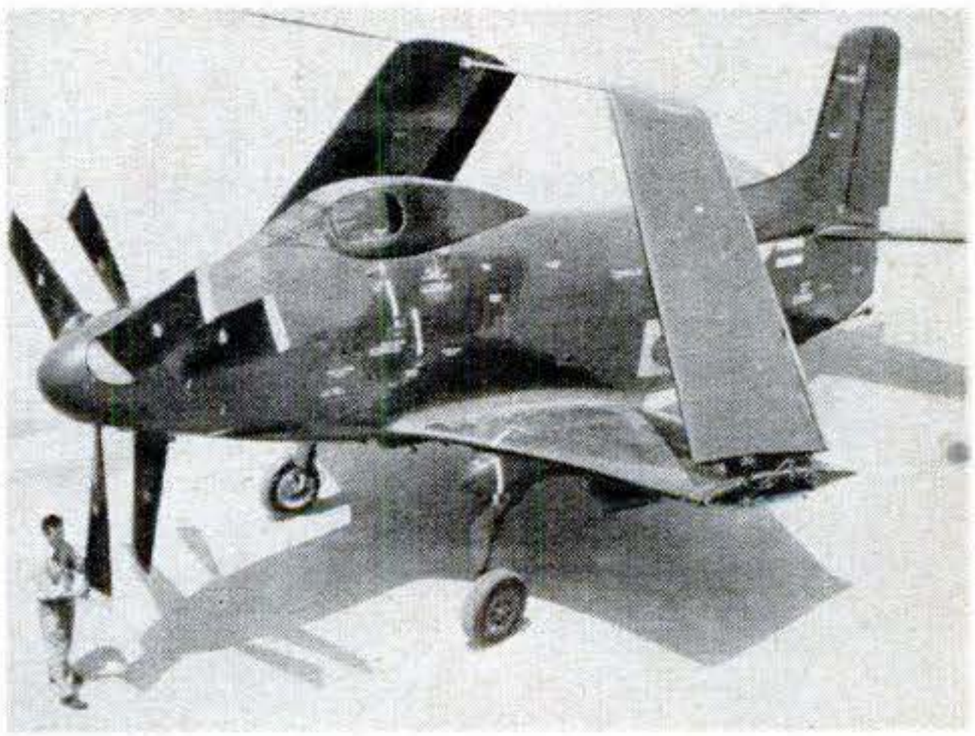
Caddy Engine Soups Up Ford

THAT'S a Cadillac engine being lowered into a standard 1950 Ford. Walter L. Williams and Harold Sheldon, of Detroit, who make the conversions for $1,000 up, claim that their hybrid jobs will do better than 120 m.p.h.



Holes Slow Practice Ball

EXCEPT for the holes, this plastic practice golf ball looks, feels, and even sounds like the real thing. But it travels only one-tenth as far when hit. The maker, Pee Gee Bee, Minneapolis, Minn., says it will not harm windows or furniture.



Navy's Turboprop Bomber

TWIN gas turbines of 5,000 hp. turn contrarotating props to give this Navy attack bomber the quick take-off of propellers and the speed of jets. Douglas built the XA2D Skyshark to fly off carriers with rockets, bombs, or torpedoes.

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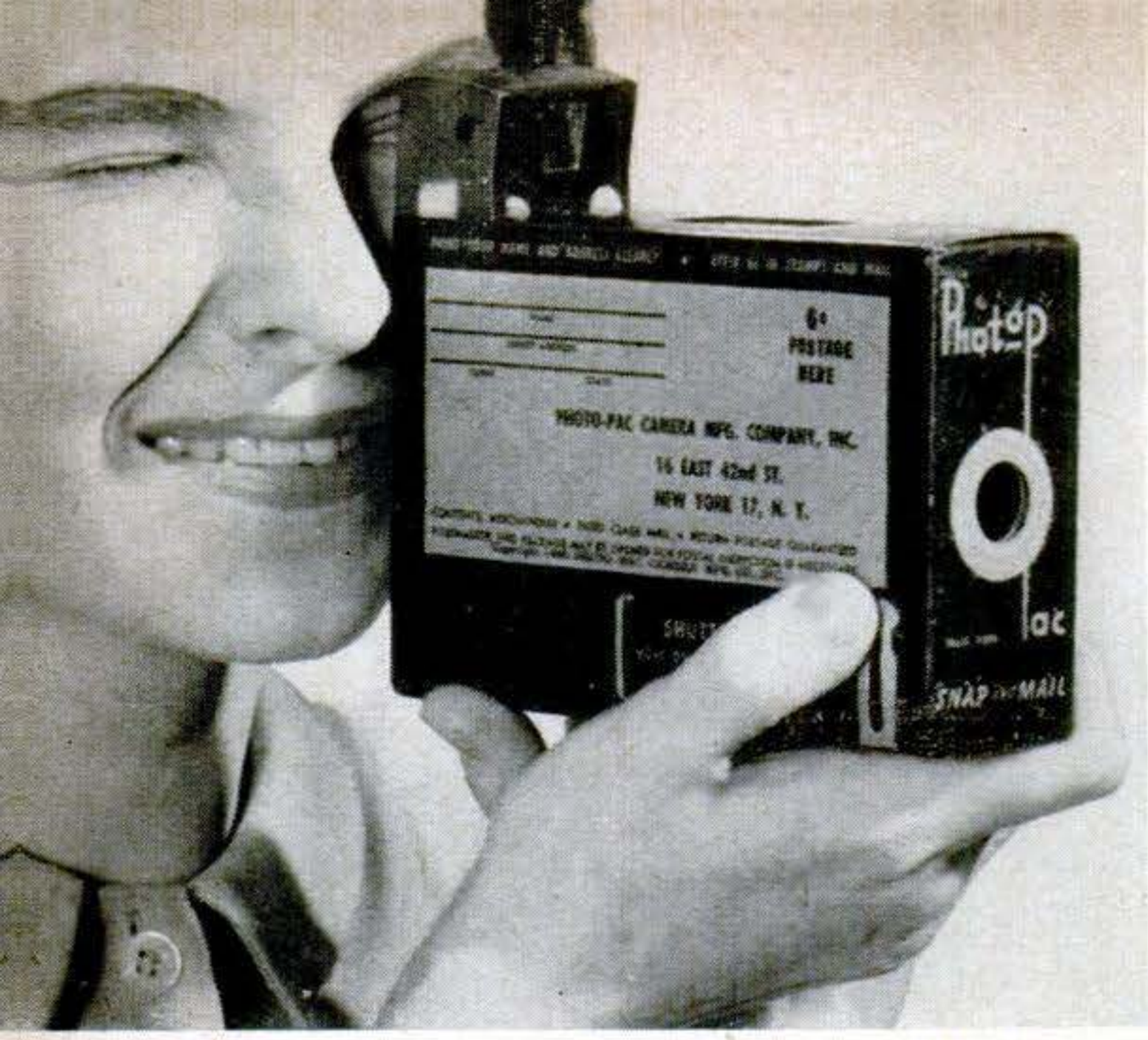
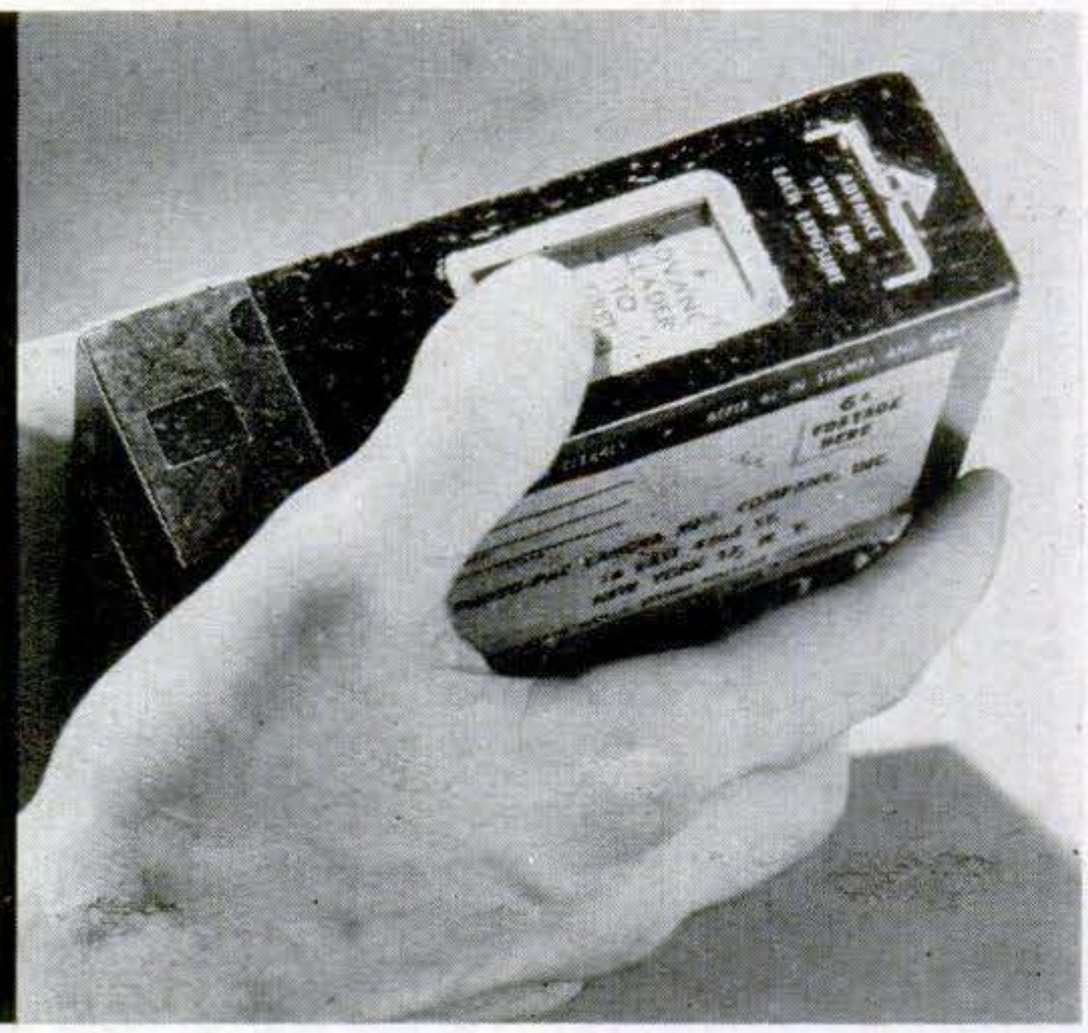


Sight, shoot, and mail—that's all. Camera is fixed-focus, box type, with meniscus lens. Film is unperforated 35 mm. Prints are enlarged to 3¼ by 4½ inches. Note self-addressed wrapper.

Film Package Is Camera, Too

EVER been caught at some beautiful scenic spot without your camera? Soon you'll be able to stop at a drugstore or newsstand and pick up one of these new Photo-Pac cameras—for $1.49. You won't have to buy any film, because that's already in it. And when you've taken the 12 exposures, just put your name and address on the pasteboard wrapper and drop the whole thing in a mailbox. You'll soon get back a set of enlarged prints. You won't get the camera back, because that's reloaded and sold again. Now available at Gimbels in New York City, the cameras will go on sale throughout the country soon.

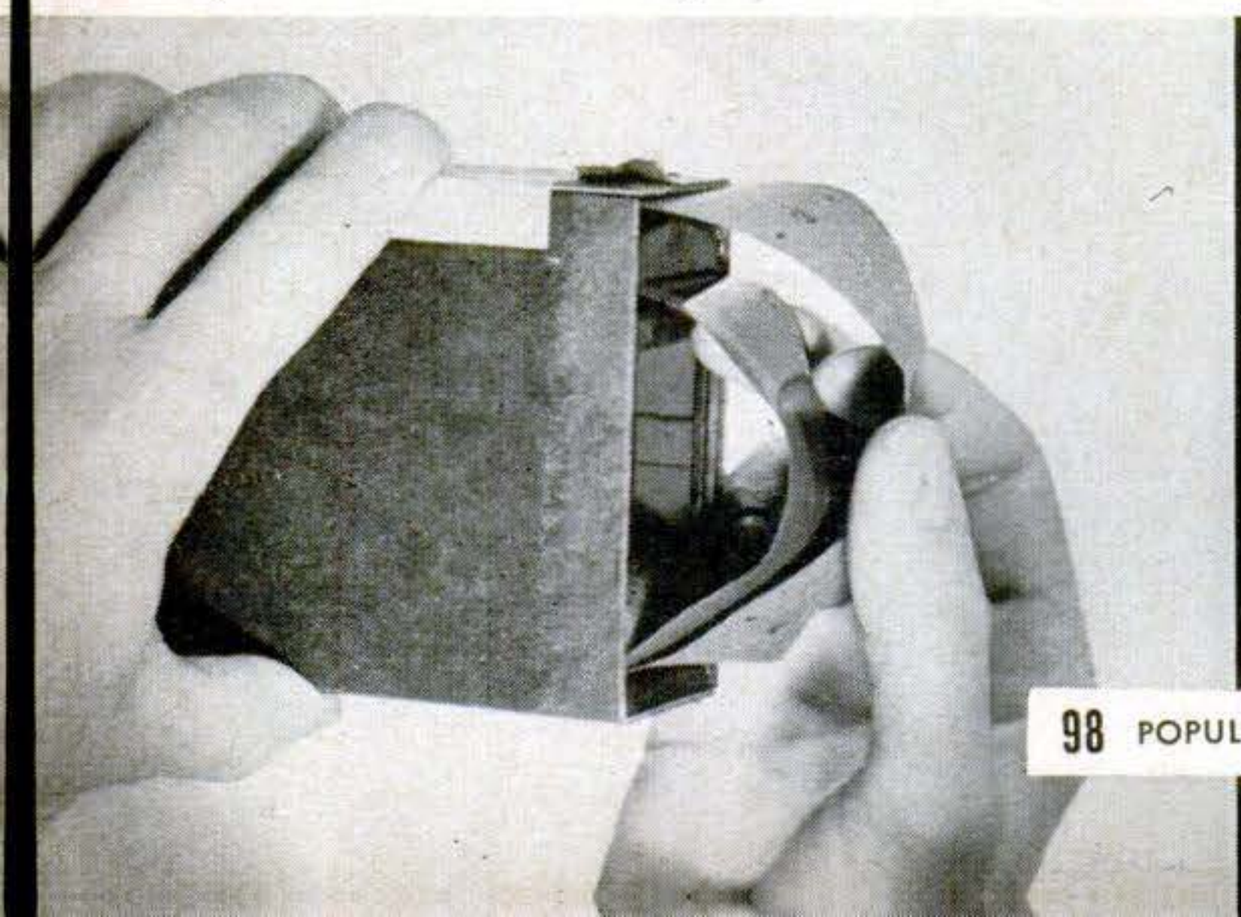
Folded tab on top of pasteboard wrapper forms view finder. User sights through hole in back, sees picture framed in square cutout in front. Finder can even be adjusted for parallax.

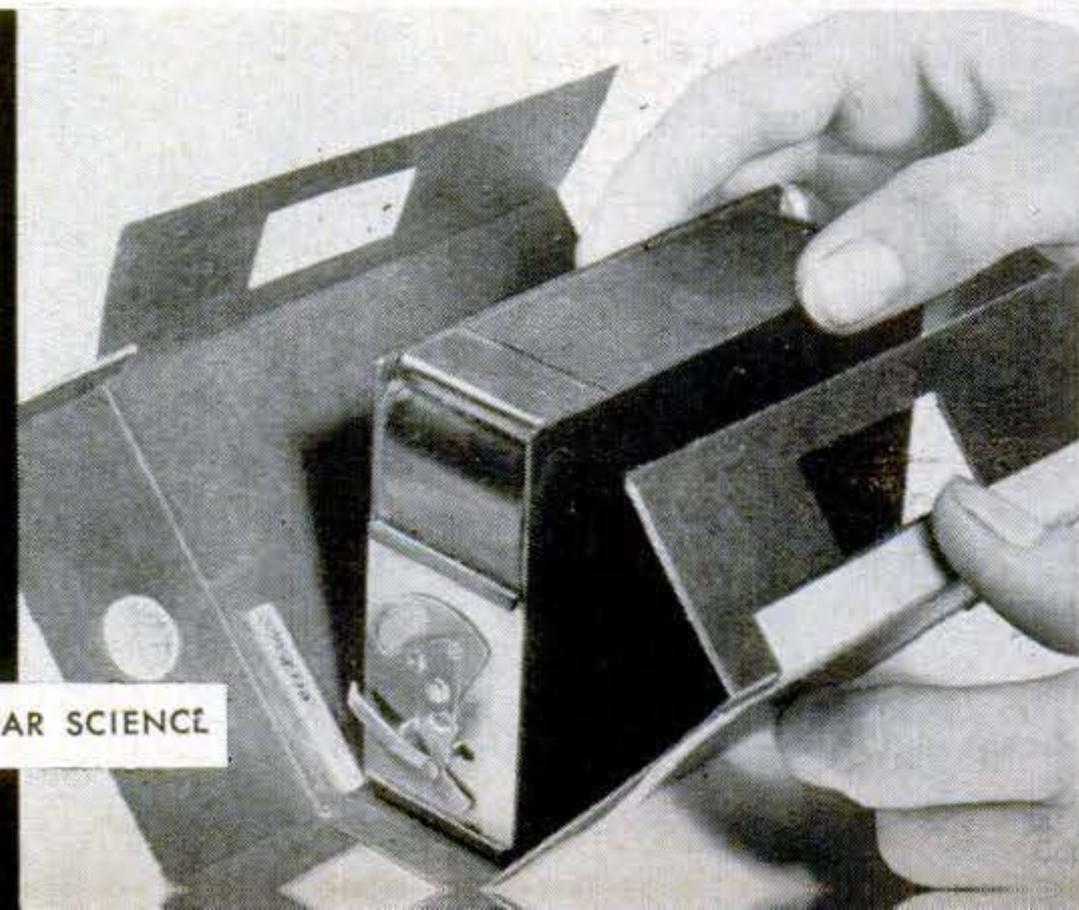


Cutout in top of wrapper lets paper leader show through. Film is advanced by simply pushing leader forward with thumb until exposure numbers on leader line up with arrows on wrapper.

Paper leader, rolled up with film, acts as simple transport mechanism to advance film after each exposure. At factory, old wrapper and exposed film are removed, and the camera reloaded.

Heavy, black cardboard, under lighter mailing wrapper, keeps out light, protects molded-plastic camera inside. Simple shutter is spring-actuated, single-blade type, with 1/50-sec. speed.





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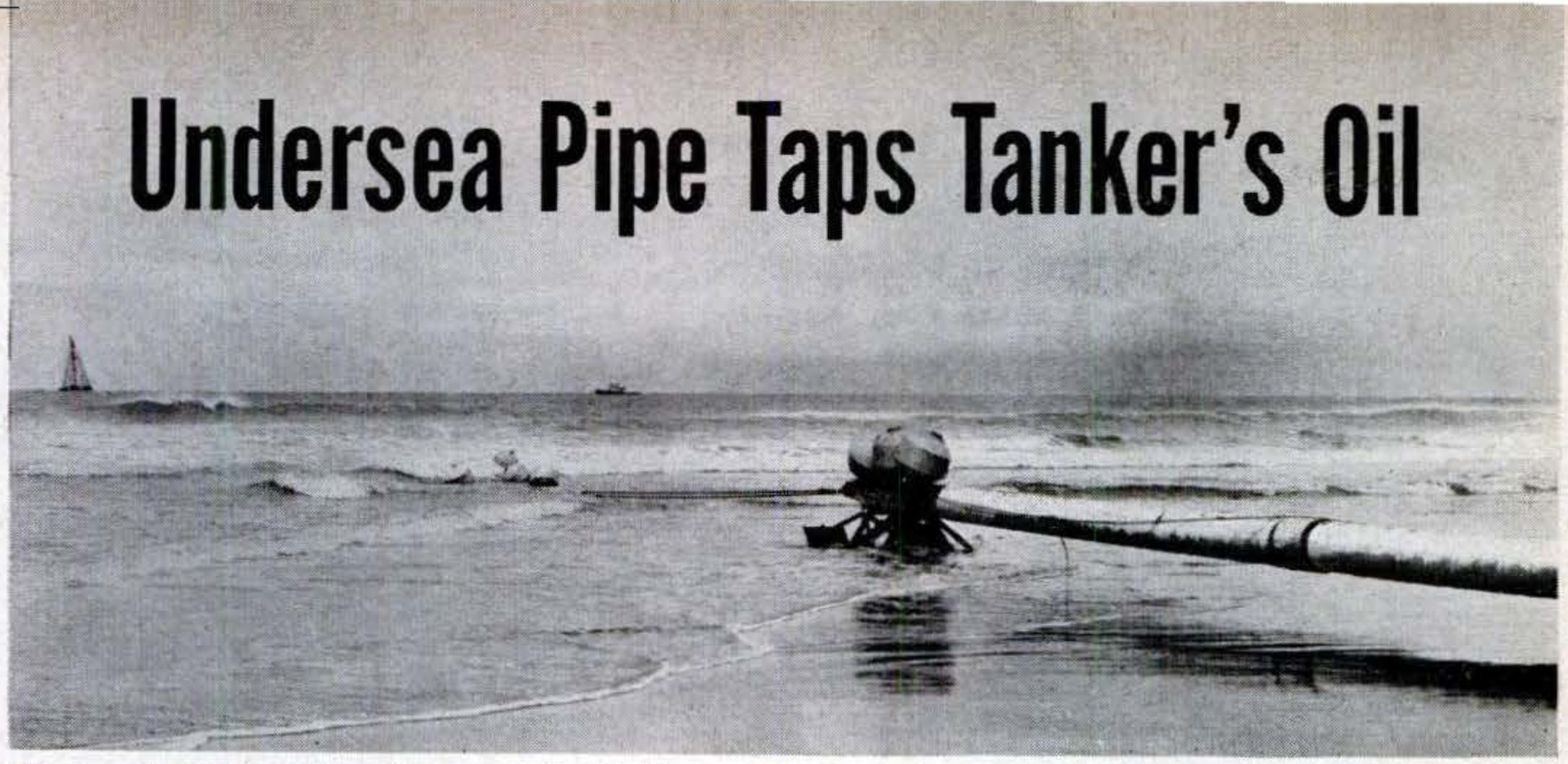
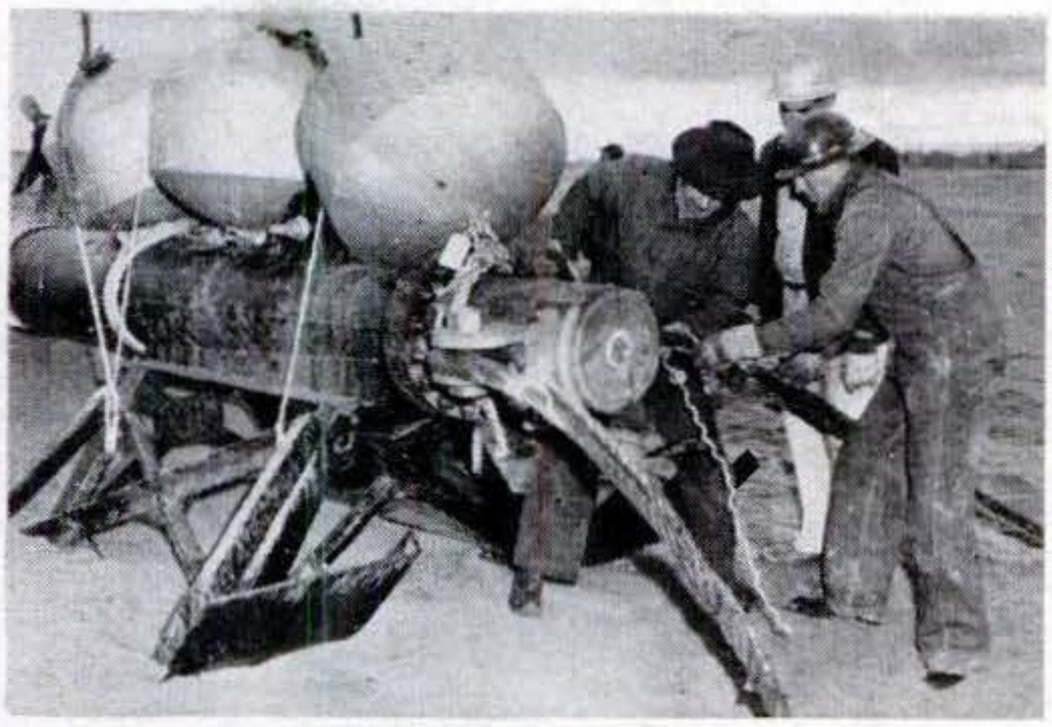
Undersea Pipe Taps Tanker's Oil



Sliding down beach on heavy sled, winch-towed oil pipe starts 3,500-foot journey into the sea.



Heavy towing cables from winches aboard anchored barge are attached to end of first pipe section. Sled keeps pipe end from digging into sand, and small steel buoys lessen pipe's weight.

THIS new "submarine service station" can transfer 120,000 barrels of oil a day from ship to shore. A pipe extending ¾ of a mile into the ocean, it permits tankers to deliver fuel oil directly to a power plant on shore. An anchored tanker hauls up the buoy-marked end of the pipe and starts pumping.

When the pipe was laid, the first of its seven sections was towed into the water by a cable hitched to a winch on a barge anchored 3,500 feet out. Then sections were joined to the shore end one by one, and the growing line dragged out until the entire pipe was in place. Pacific Gas and Electric did the job at Moss Landing, Calif.

As pipe is pulled out to sea, succeeding sections are welded into place, and joints are coated with compound to prevent corrosion. Pipe is 18 inches in diameter, 3,590 feet long.

First oil delivery is made as tanker anchors near marker buoy, pulls up 200-foot, flexible tube attached to sea end of pipe, and starts pumping. It discharges 8,000 barrels an hour.

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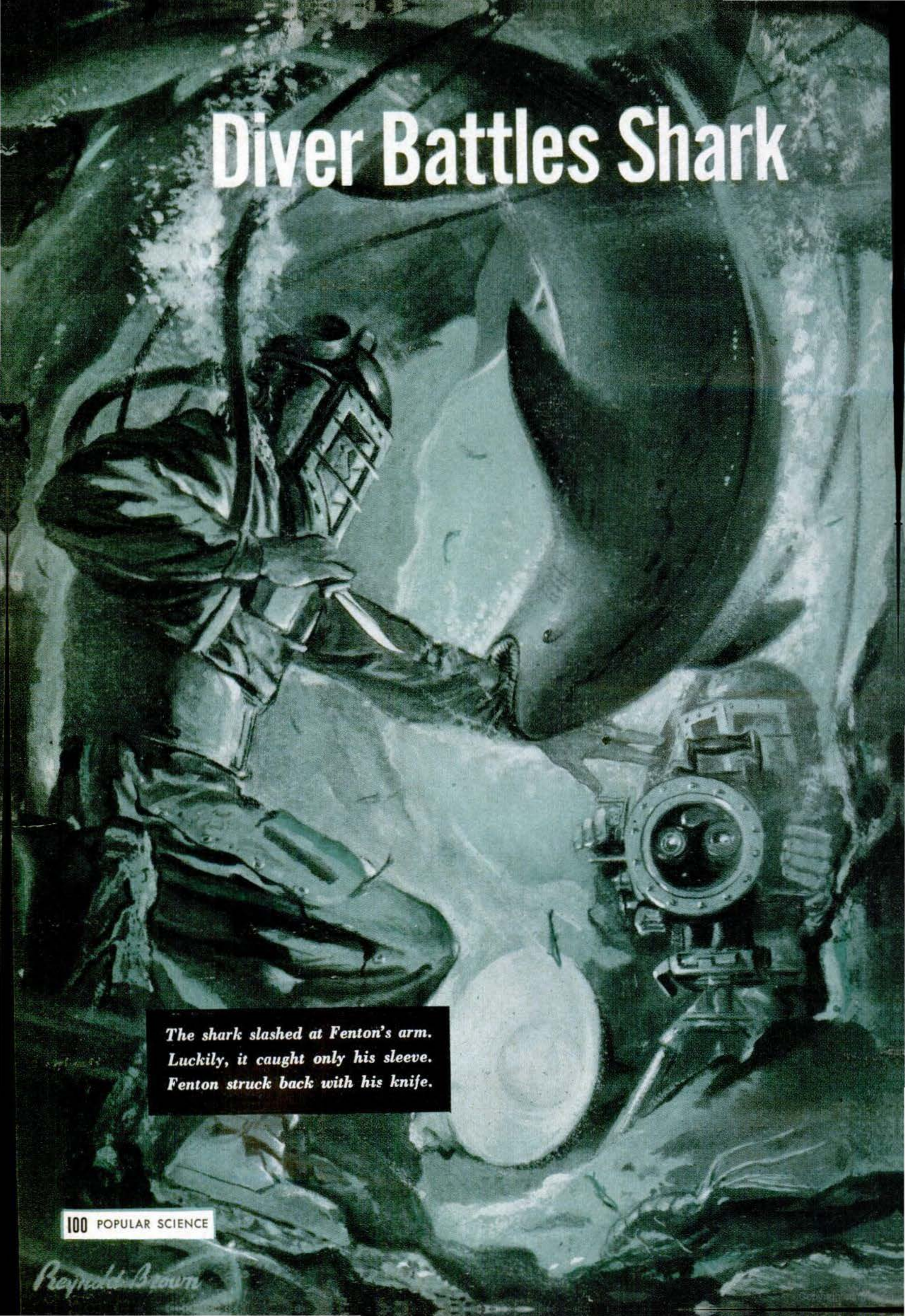
Diver Battles Shark



The shark slashed at Fenton's arm. Luckily, it caught only his sleeve. Fenton struck back with his knife.

in Tunnel Under Sea

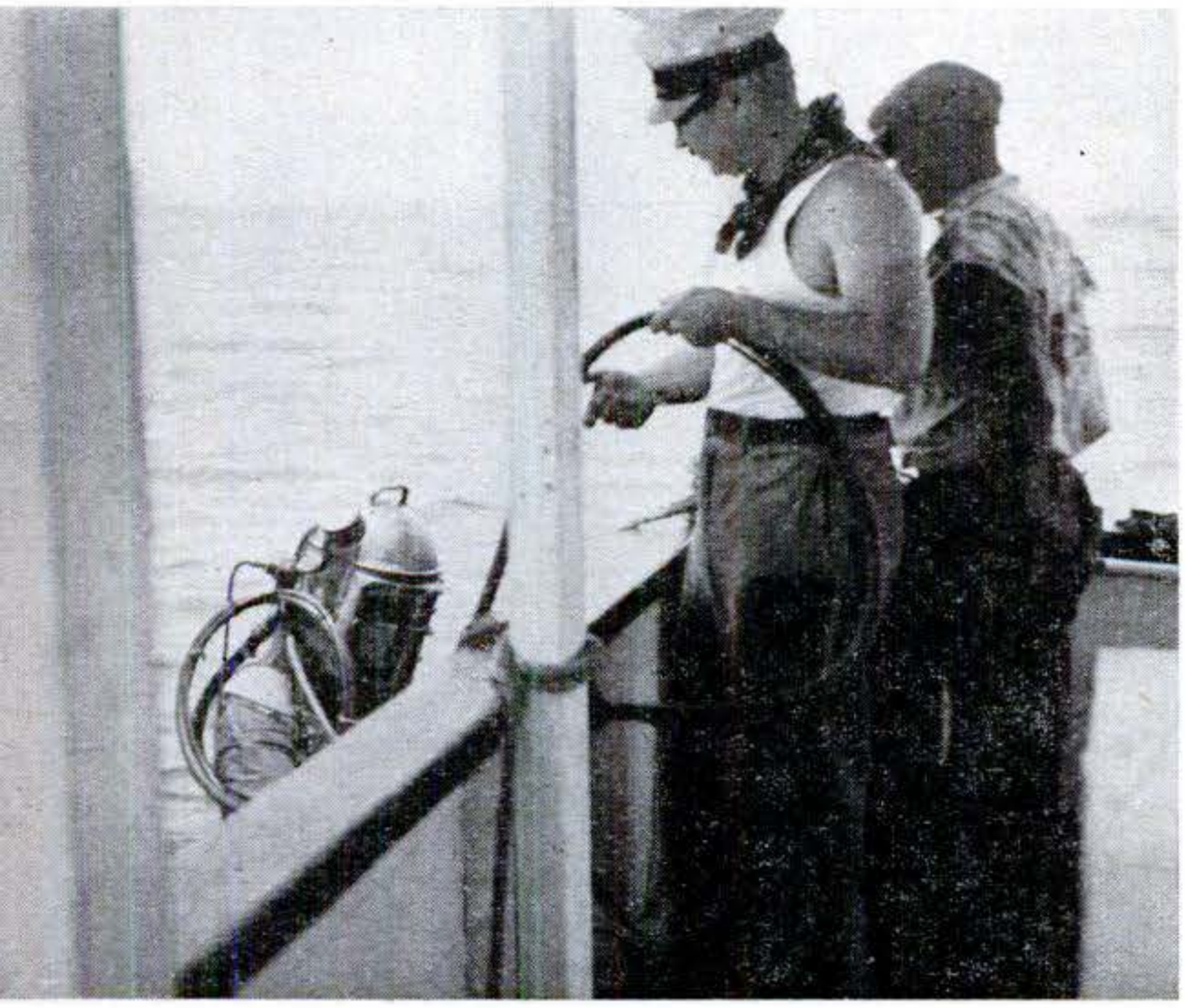
DON'T take a poke at a shark—even a harmless one. That's the advice of John Fenton, and he learned the hard way—40 feet down in the Middle Bight of the Andros Islands in the Bahamas.

All Fenton wanted to do was test a new underwater movie camera. One day he and H. S. Moncrief, manager of the Fenjohn Underwater Photo & Equipment Co., were on the bottom, combining a little pleasure with business by testing the camera in a strange undersea tunnel. That's when the shark came along.

It was a seven-foot seven-inch nurse shark. Nurse sharks are harmless—the books say—so Fenton patted it on the head. This the shark didn't like. It slashed at Fenton's arm. Luckily it caught only his sleeve. Fenton struck back with his knife. Even after the shark had been killed, its grip was so tight that he had to cut away his sleeve to get free.

How did the camera work? Perfectly. The underwater photographs on this page and the next are taken from the test film.

1 **Discovery of this salt-water pond** on Gibson Cay, a coral island, began adventure. Crew guessed an underwater tunnel led to sea, decided to explore while testing camera.



2 **Over the side** goes one of the divers. Equipment to be tested is new undersea movie camera—a newsreel Eyemo adapted so all controls can be worked from outside special case.

3 **This is entrance** to underwater tunnel feeding inland lake. Notice fish (upper right), attracted by bright light from special underwater lamp held by diver. *[Continued on next page]*

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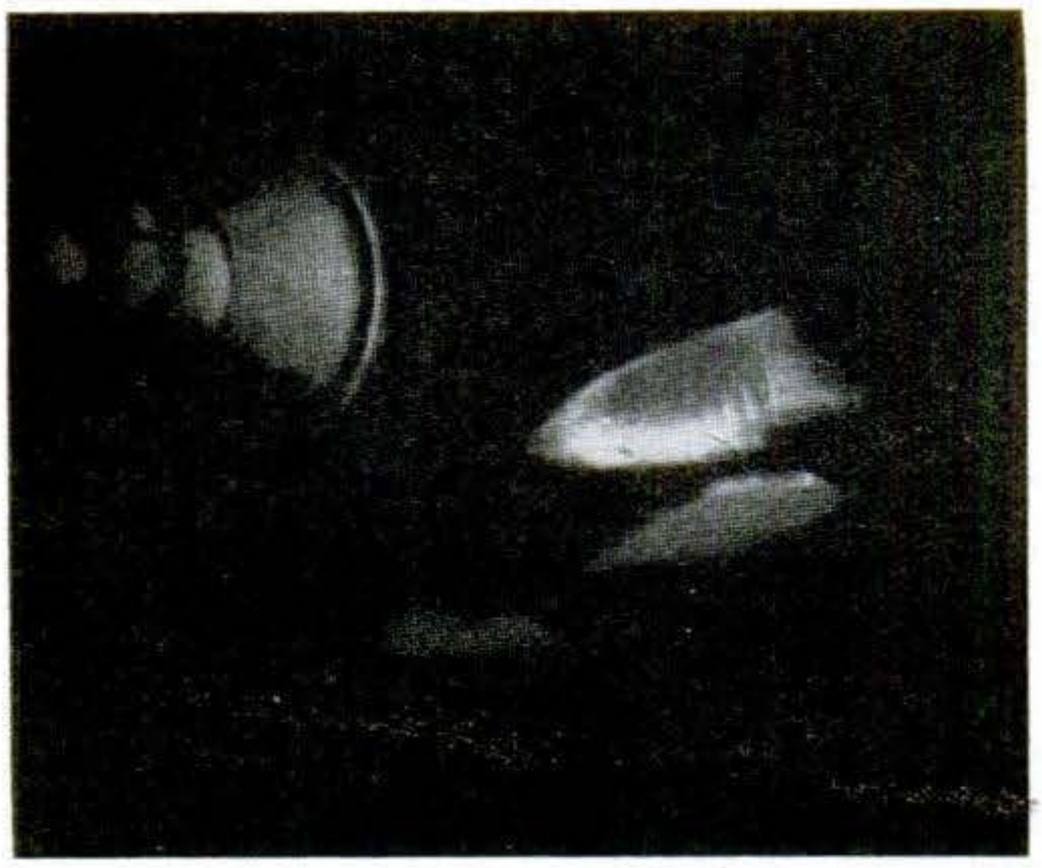
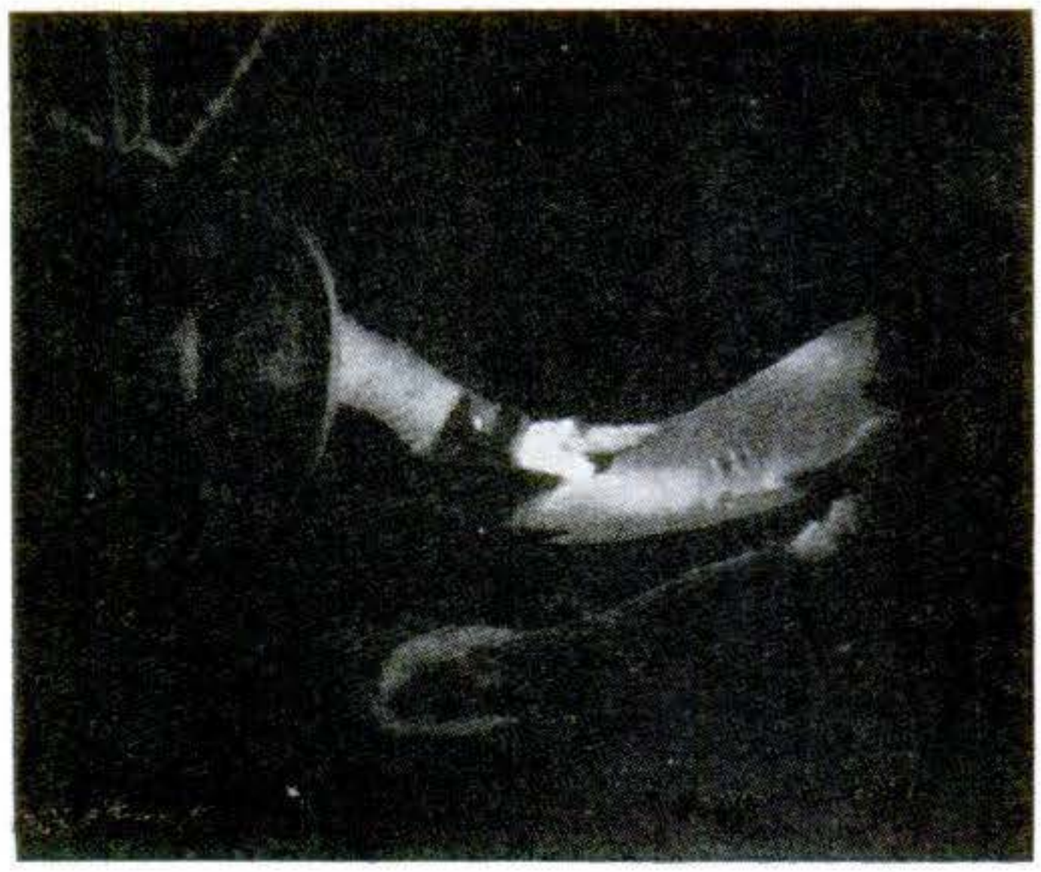
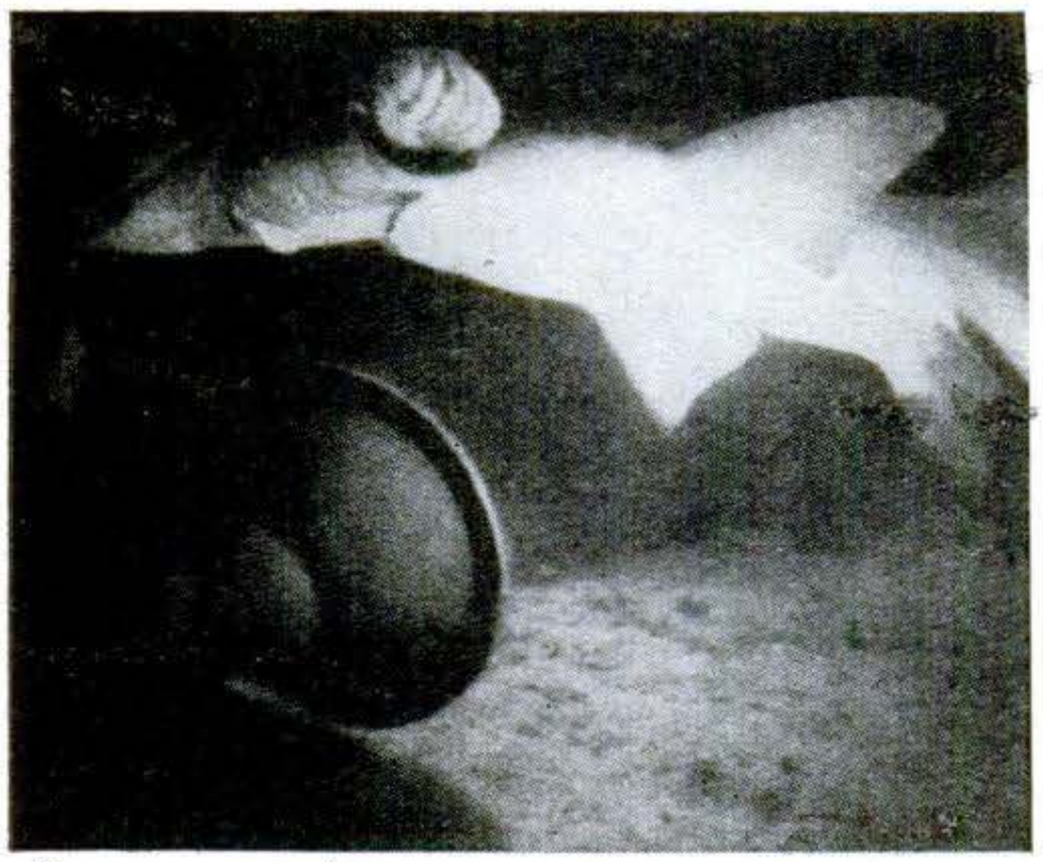


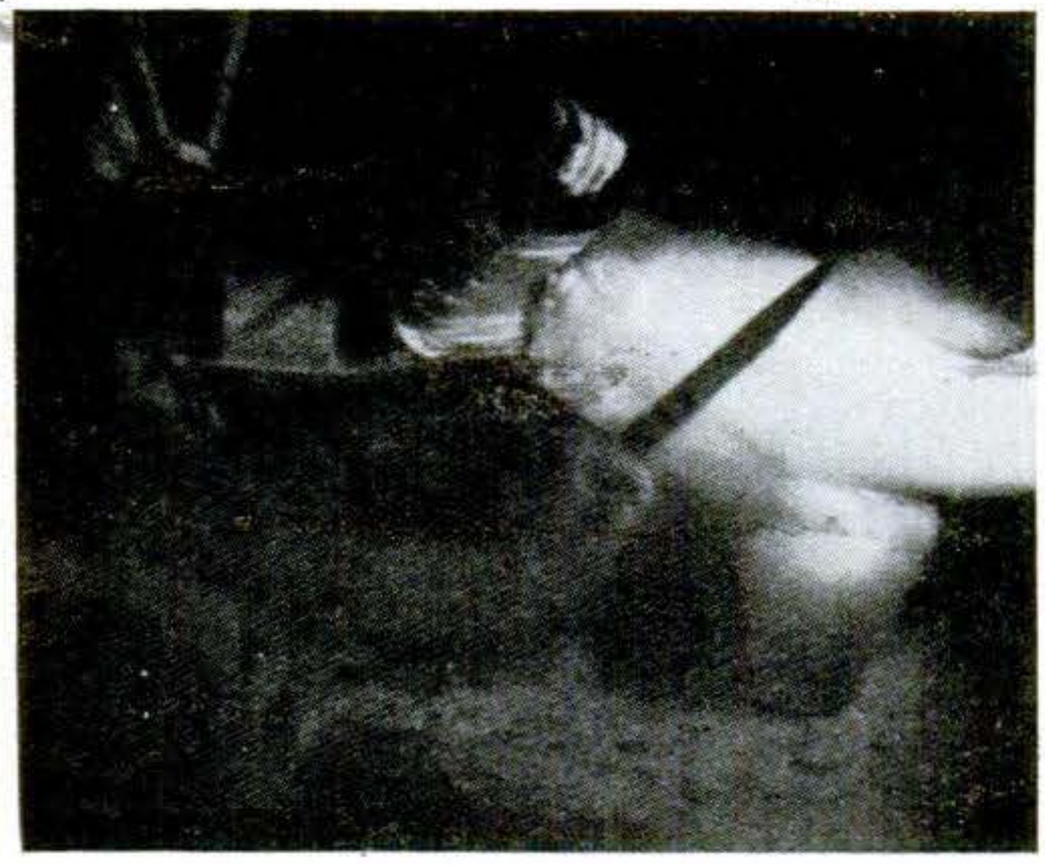
4 **Here comes trouble**—a shark that cameraman H. S. Moncrief says "later measured 7 feet 7 inches, but looked twice as big." Fenton recognizes it as a "harmless" nurse shark.



5 **So Fenton pats it on the head.** This is a mistake. The shark "either had a sore head or it was one," reports Moncrief, who sticks by the camera until the fight is nearly finished.



6 **The shark strikes.** It narrowly misses a big bite of Fenton's arm, but instead catches his sleeve. It holds on with a viselike grip, twisting and shaking the way a bulldog does.



7 **Fenton fights back** with knife. He kills the shark, later has to cut sleeve away to loosen fish. This is the last fight picture: Moncrief leaves camera at this point to help Fenton.

8 **Happy ending** for everybody except the shark. It was cut up and thrown back into the ocean for its relatives to eat. The test film was okay—these pictures were enlarged from it.

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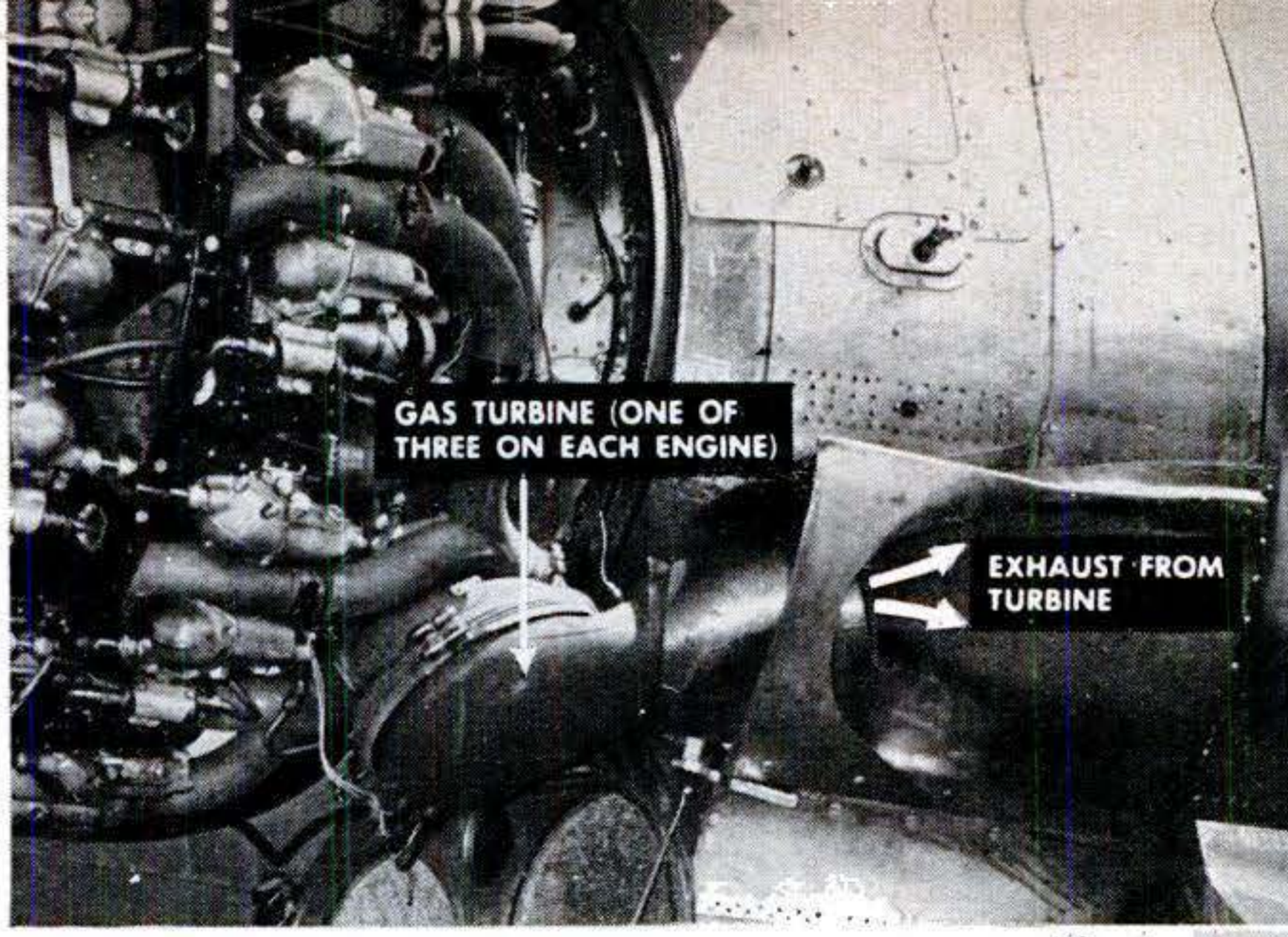
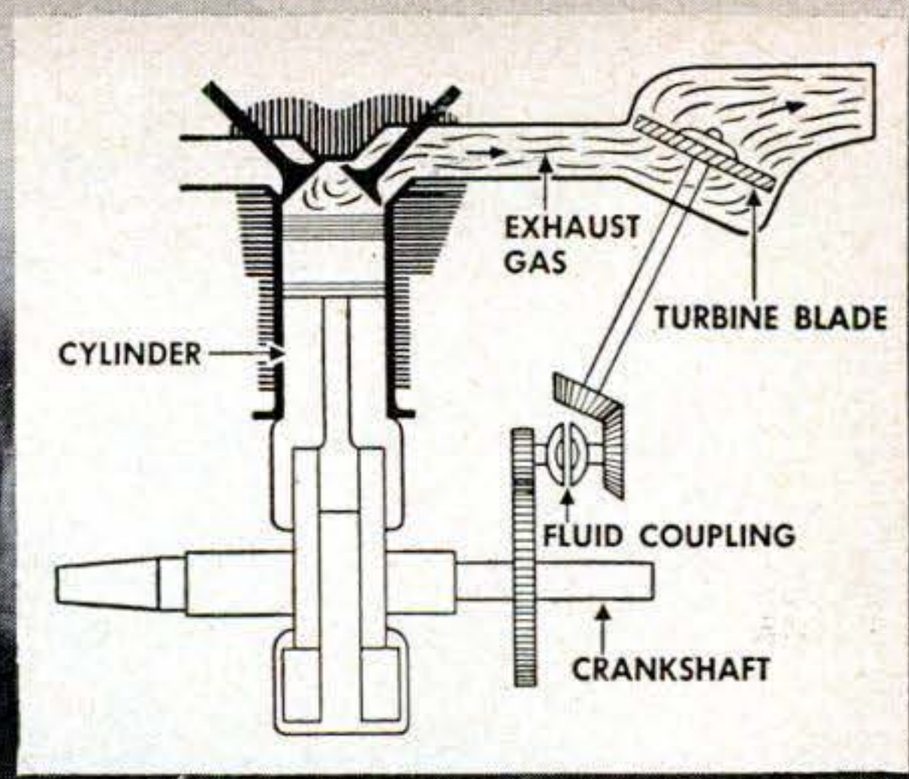




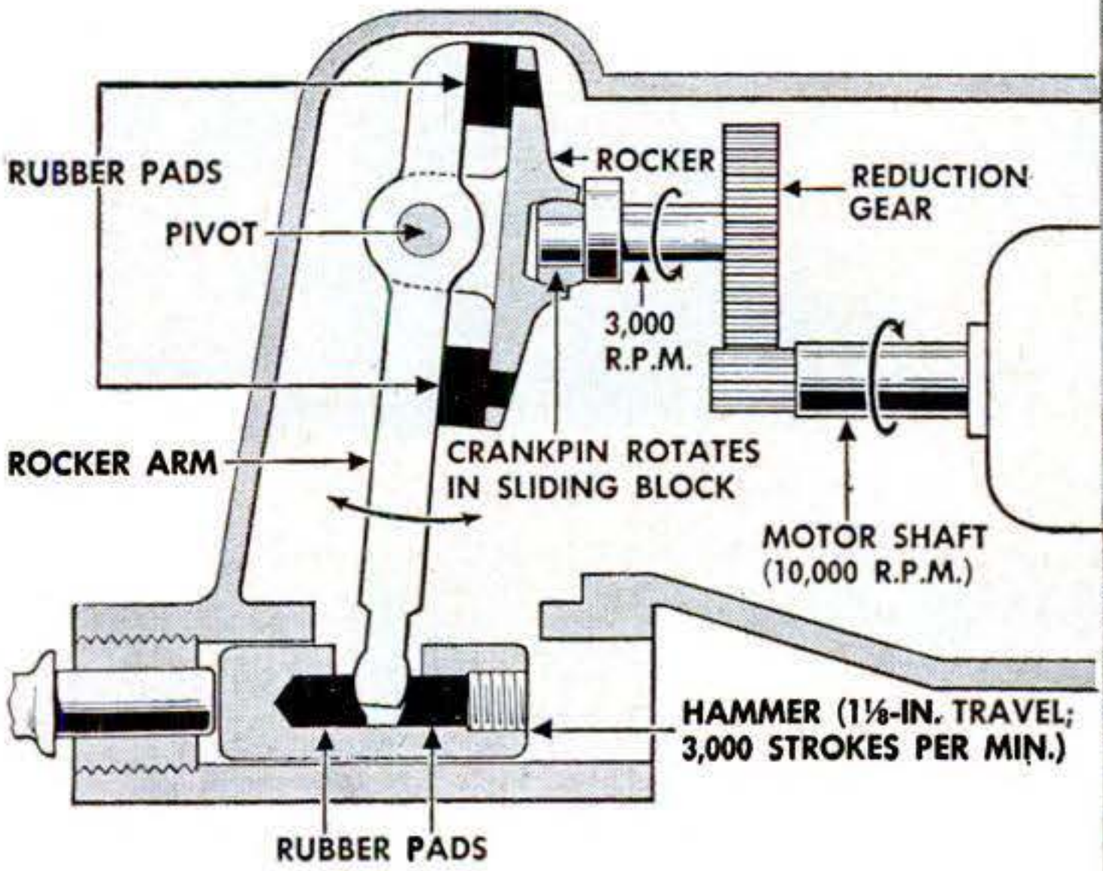
Waste-Saving Engine Gives Plane More Power

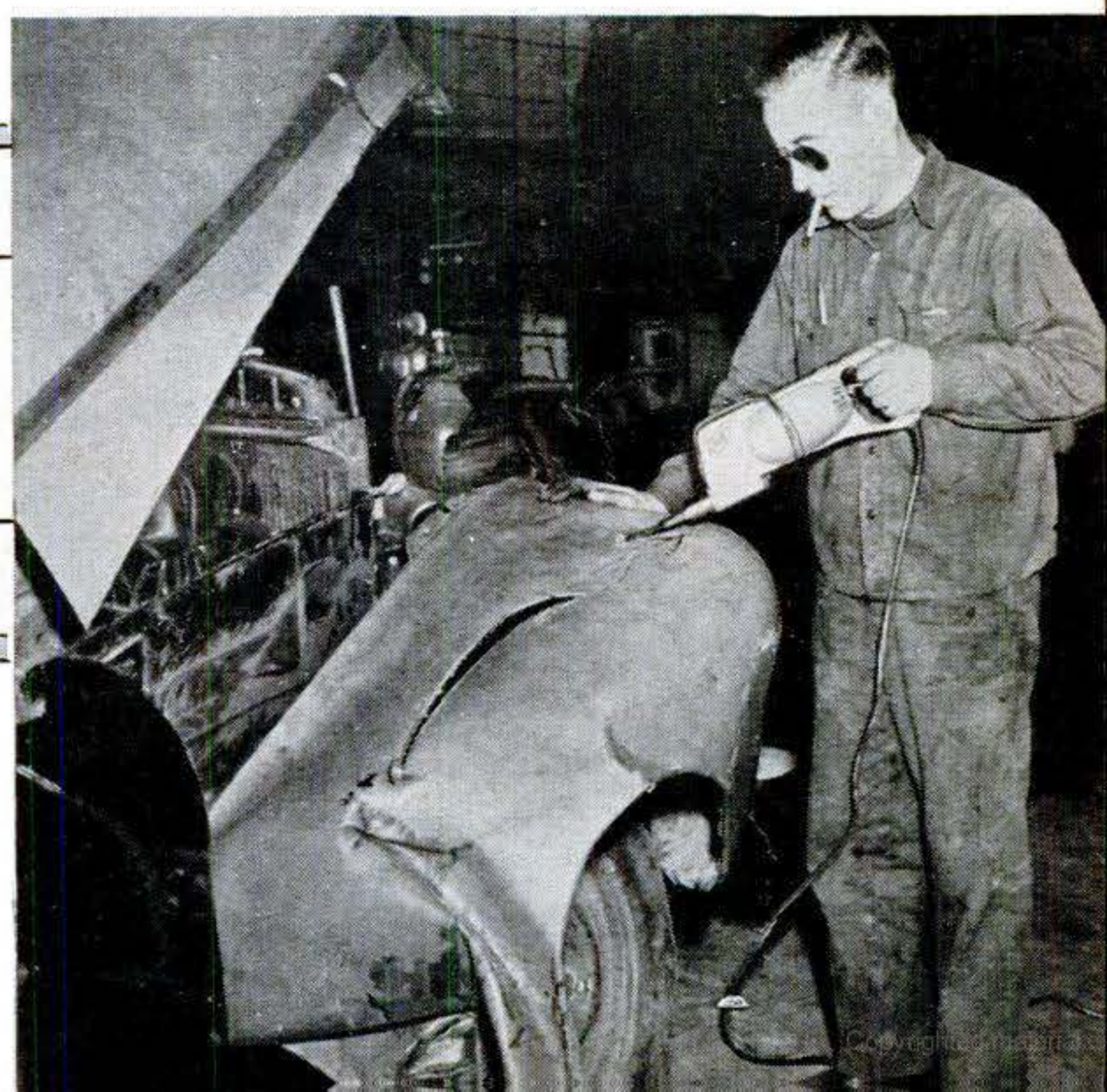
ENGINE exhaust gases, once spewed wastefully into the air, are now being put to work to give added power to the Navy's long-range P2V-4 Neptune patrol plane. Installed for the first time in a production-model plane, the new Wright compound engine (PS, Dec. '48, p. 128) is basically a piston engine. Its cylinder exhaust gases, however, are used to spin turbines that are linked through a fluid coupling to the engine crankshaft. The result is a 20-percent increase in power, adding vital speed, range, payload, and take-off power—all for free on the same amount of fuel.

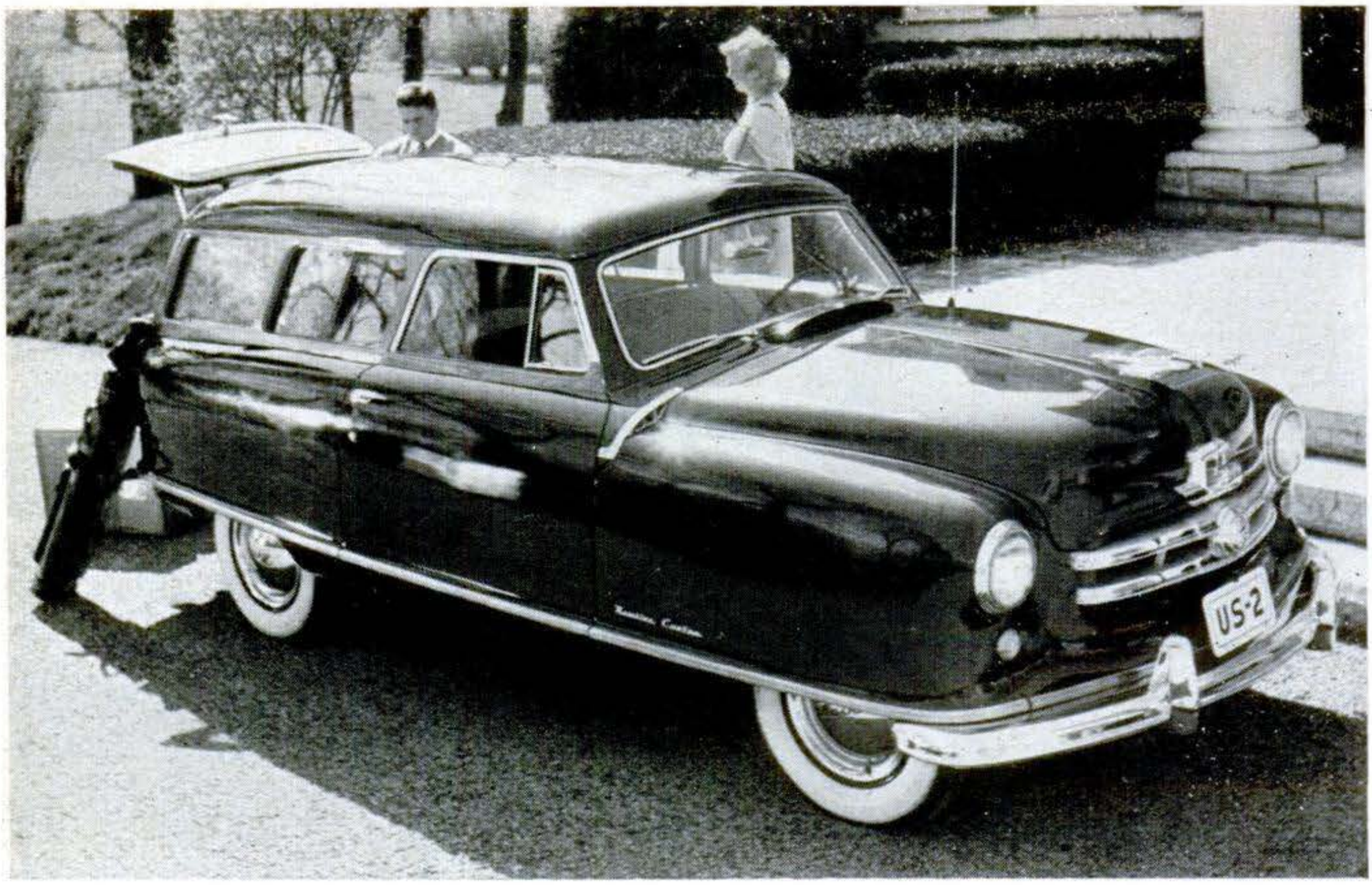
New Motorized Hammer Has More Kick, Less Jar

THIS new lightweight electric hammer weighs only 7½ pounds, yet is said to pack the wallop of much heavier, more expensive tools. It will slice through auto-body steel (right below) at six inches a second, drill through masonry at an inch a minute.

The secret is an ingenious method of converting rotary motion to reciprocating motion, invented by R. F. Jackson, of Cleveland, Ohio. The motor drives a crank pin fitted into a pivoted rocker, moving the rocker back and forth as the pin turns (drawing). This rocking motion is transmitted by two neoprene-rubber pads to an arm that actuates a ¼-pound hammer. The rubber absorbs shocks and gives the hammer a whip action that sharpens its blows and nearly doubles its normal length of travel. Made by Noble & Stanton, of Bedford, Ohio, the Super Slugger sells for $89.

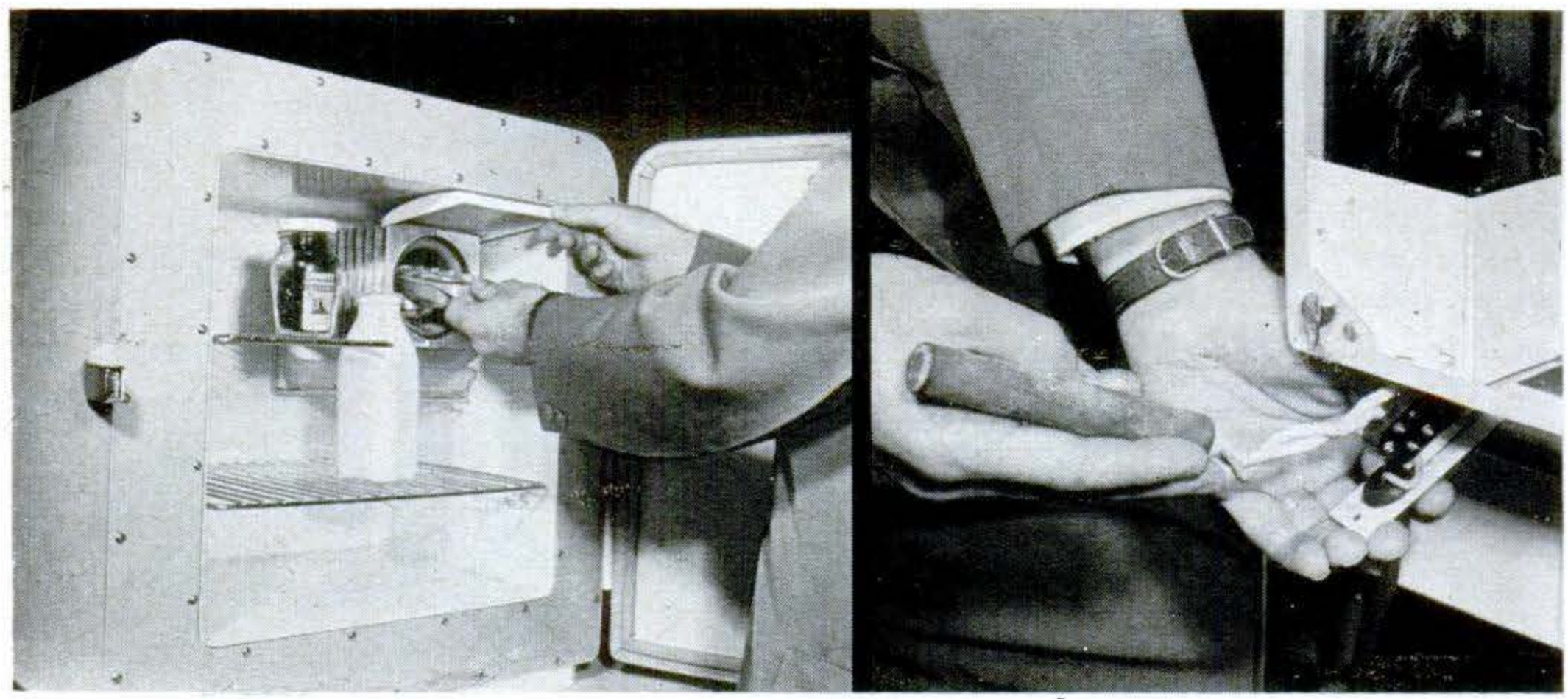






Small-Size Station Wagon

CALLED the lowest-priced custom station wagon on the market, the Rambler, above, is now part of the Nash line. The basic mechanical features duplicate those introduced in the Rambler convertible sedan (PS, May '50, p. 110). The five-passenger, two-door station wagon has 100-inch wheelbase, and an 82-hp. six-cylinder engine of 7.25-to-1 compression ratio. Overdrive is an optional extra, but a radio, special ventilating system, and turn indicators are standard. An all-steel body, with simulated wood trim, cuts weight. Backed with steel, the rear seat folds forward to lengthen and become a part of the cargo-compartment floor, under which the spare wheel is stored.



Refrigerator Works Anywhere

A PORTABLE refrigerator that works on almost any kind of electric power can keep food cold even in your car. The two-cubic-foot box employs the heat-cooling principle long used in gas and kerosene refrigerators, but has an electric heating element instead of a flame. The inexpensive element is easily changed (above) to suit almost any voltage between six and 220. It consumes about 95 watts. The Astral, available for some time in England and Canada, is now sold by Macy's in New York for about $130.

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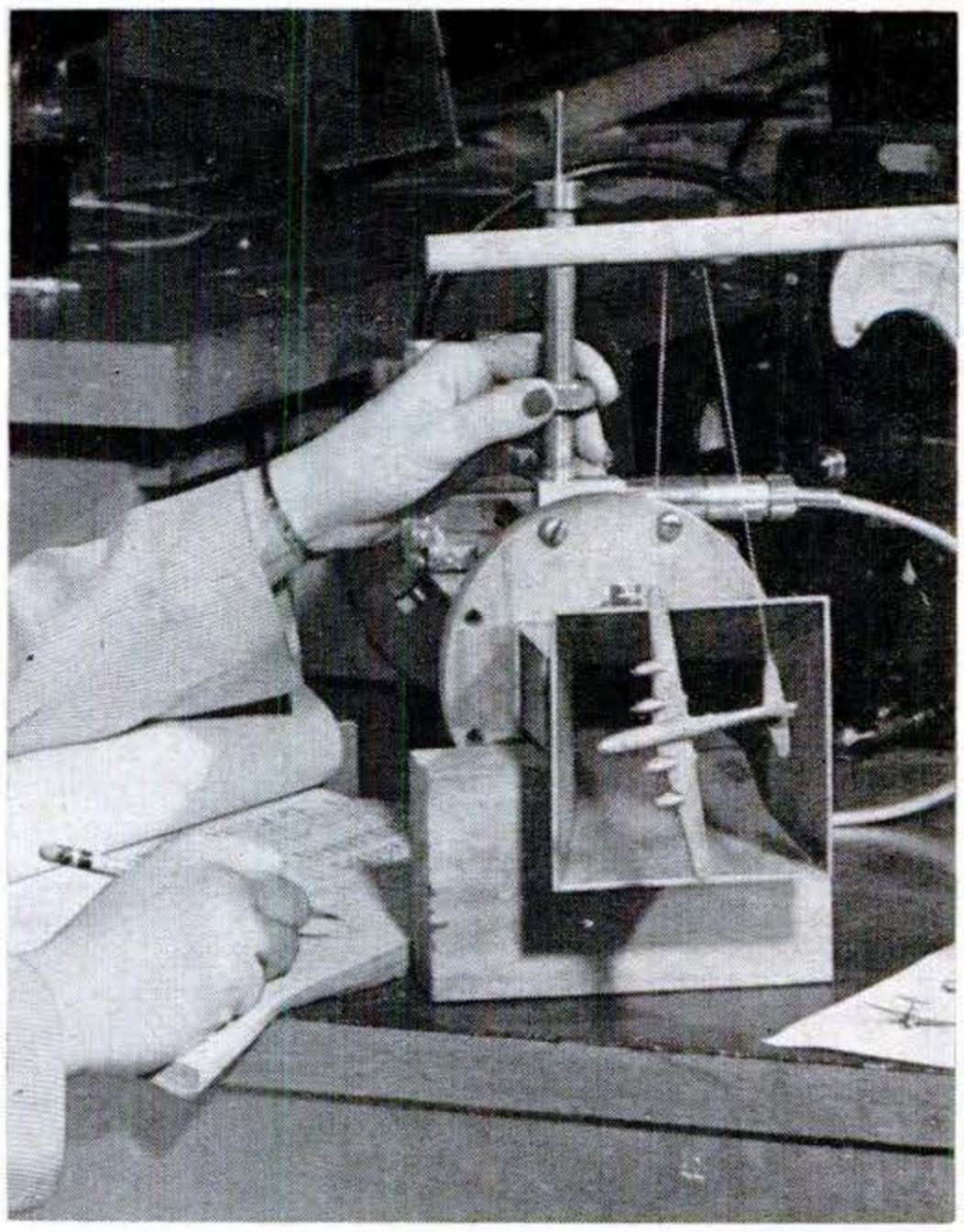
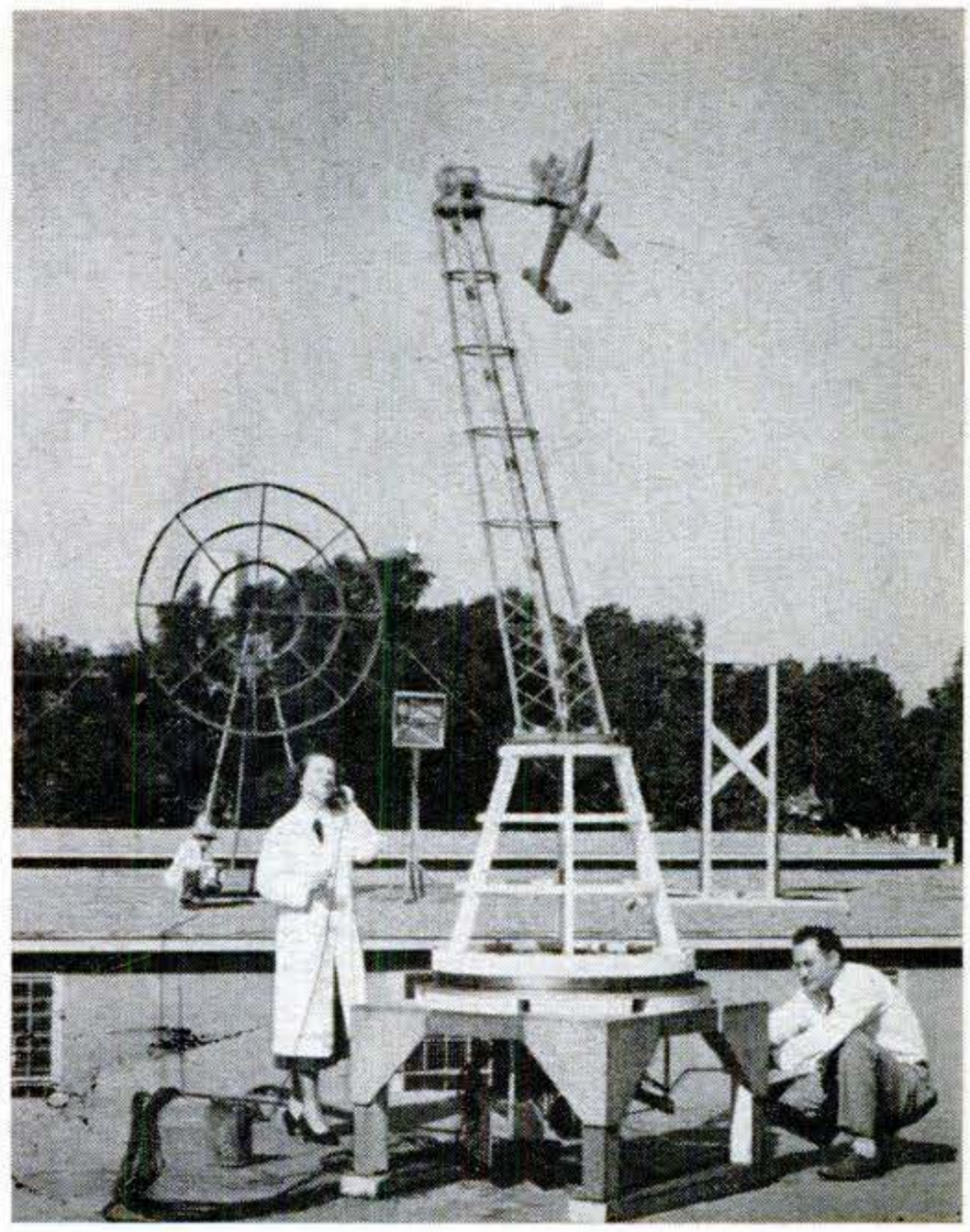
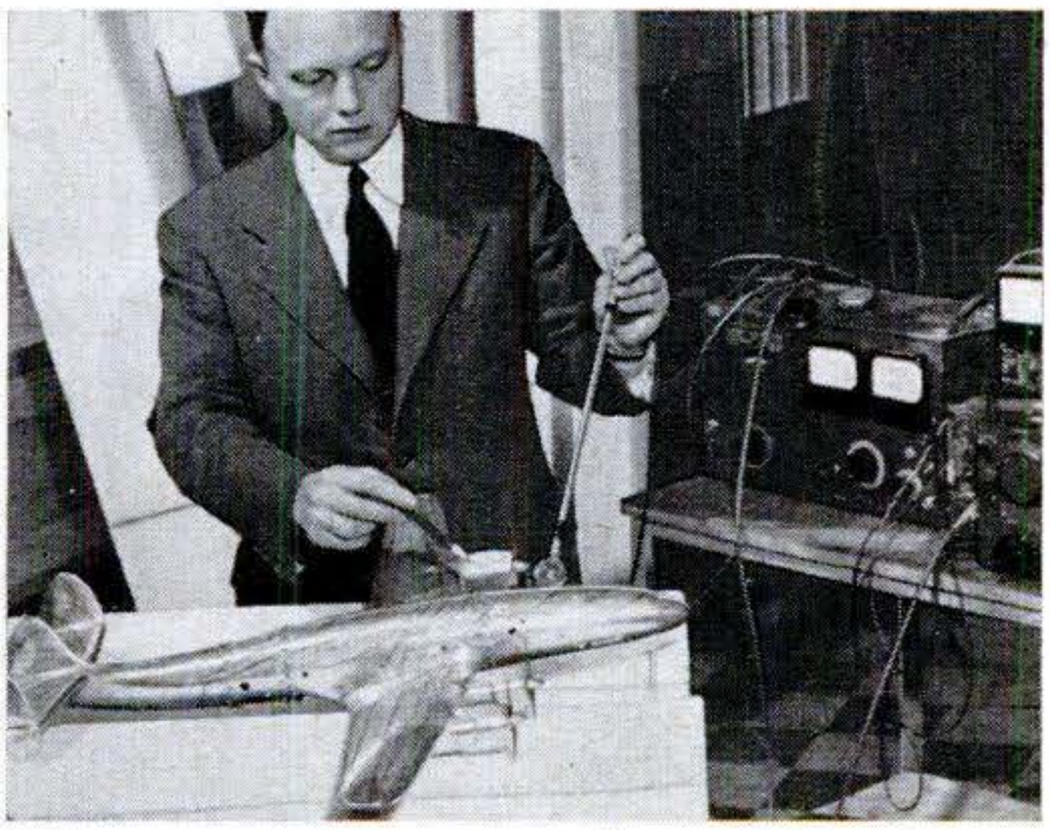


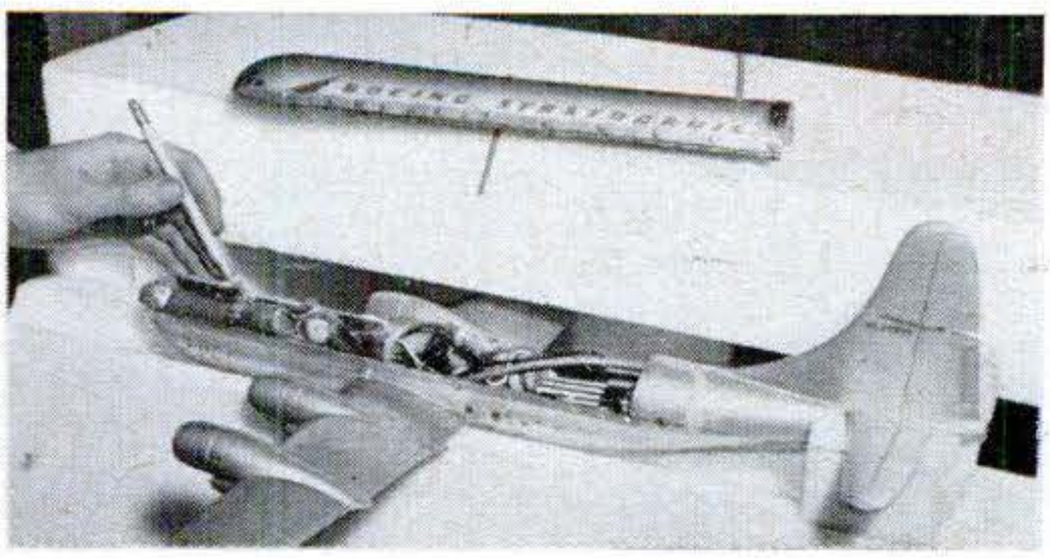
This B-29 has wings only four inches long, but it tells Stanford researchers how radio waves react with the structure of a full-size plane. For the test, microwaves from the horn are used.



On measuring range, the effect of angular heading of an aircraft on an experimental antenna is being studied. Circular structure in the background is a directional receiving antenna.



What happens to the radio currents from a buried antenna in this model Constellation is traced with tiny loop antenna (end of stick).



The cargo in this miniature Stratocruiser is an instrument that measures radiation patterns from an experimental tail-cap antenna.

Models Show Way to Hide Antennas

AT THE rate radio aids have been added to aircraft, it is a wonder that their interiors don't look like overstocked radio stores—and their exteriors like antenna-quilled flying porcupines.

The reason they don't is that electronic engineers have kept pace in the laboratory, simplifying the sets and hiding the speed-wasting external antennas (PS, Oct., '49, p. 169). Fortunately, the laws governing the behavior of electromagnetic waves have permitted them to scale down both radio waves and the airplanes, so that the research can be done with models.

Already many of the answers found by Stanford Research Institute scientists in miniature have been incorporated in full-scale aircraft—saving space and weight, cutting down drag, and simplifying life for pilots and radiomen.

These Stanford scientists also are developing new kinds of electronic devices for tuning the new antennas easier and faster, and to filter outputs of the various gadgets so they don't interfere with each other. END

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Five-ton robot on wheels sticks out its arm to turn a "hot" valve in Hanford plutonium plant.

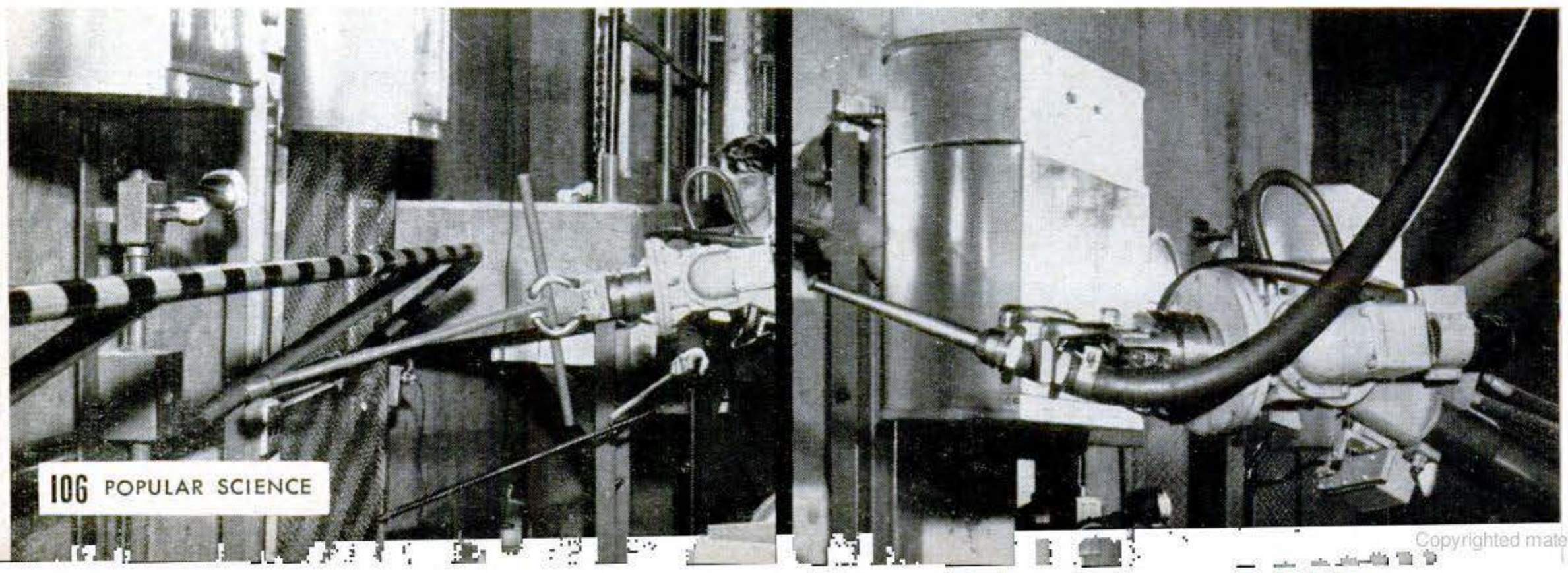
One-Armed Robot Tackles Hot Jobs

A ONE-ARMED robot is turning the valves in the giant plant at Hanford, Wash., that makes A-bomb plutonium out of uranium. The new robot looks like a railroad handcar with a small Navy gun on top. It has no fancy name, just the unimaginative title "tool dolly." But it can do practically anything the human arm can do, and it can go where human arms can't go—into areas swarming with invisible, deadly radiation.

Operated either remotely or from the dolly itself, the robot can move around on its track; raise, lower, or extend its arm (the "gun"); and grab, twist, or bend with its claw hand. The dolly easily takes apart machinery—and puts it back together again—opens and closes doors, and works with all kinds of tools. Engineers of the General Electric Co., which runs Hanford for the Atomic Energy Commission, developed it.

Typical job for robot is spinning nuts with wrench. Its wrist can bend and rotate, fingers can grasp—even pick up a dime from the floor.

Fire? Robot grabs hose, aims water wherever operator—safely far away—wants. Everyday jobs include disassembling, assembling machinery.



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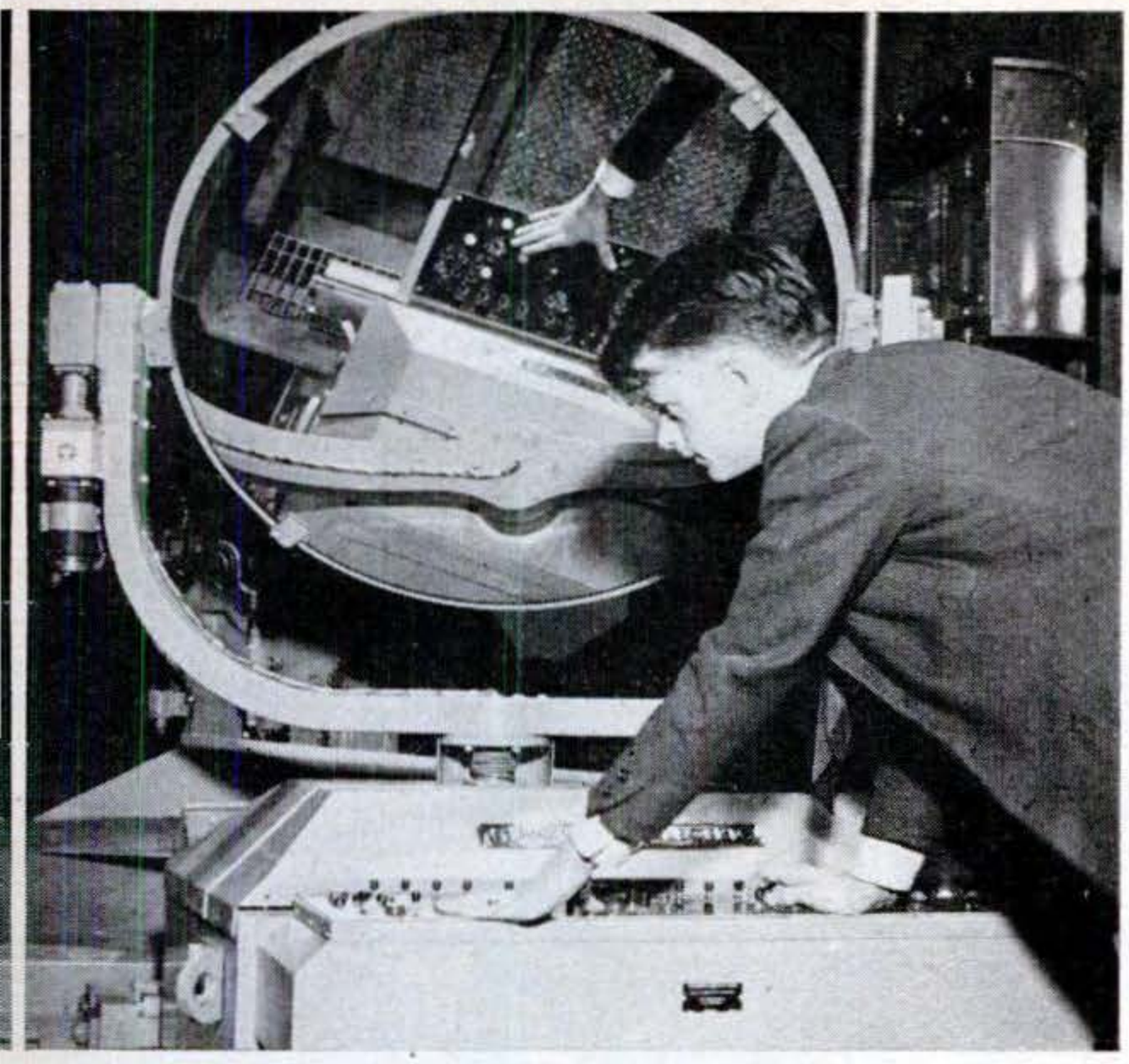
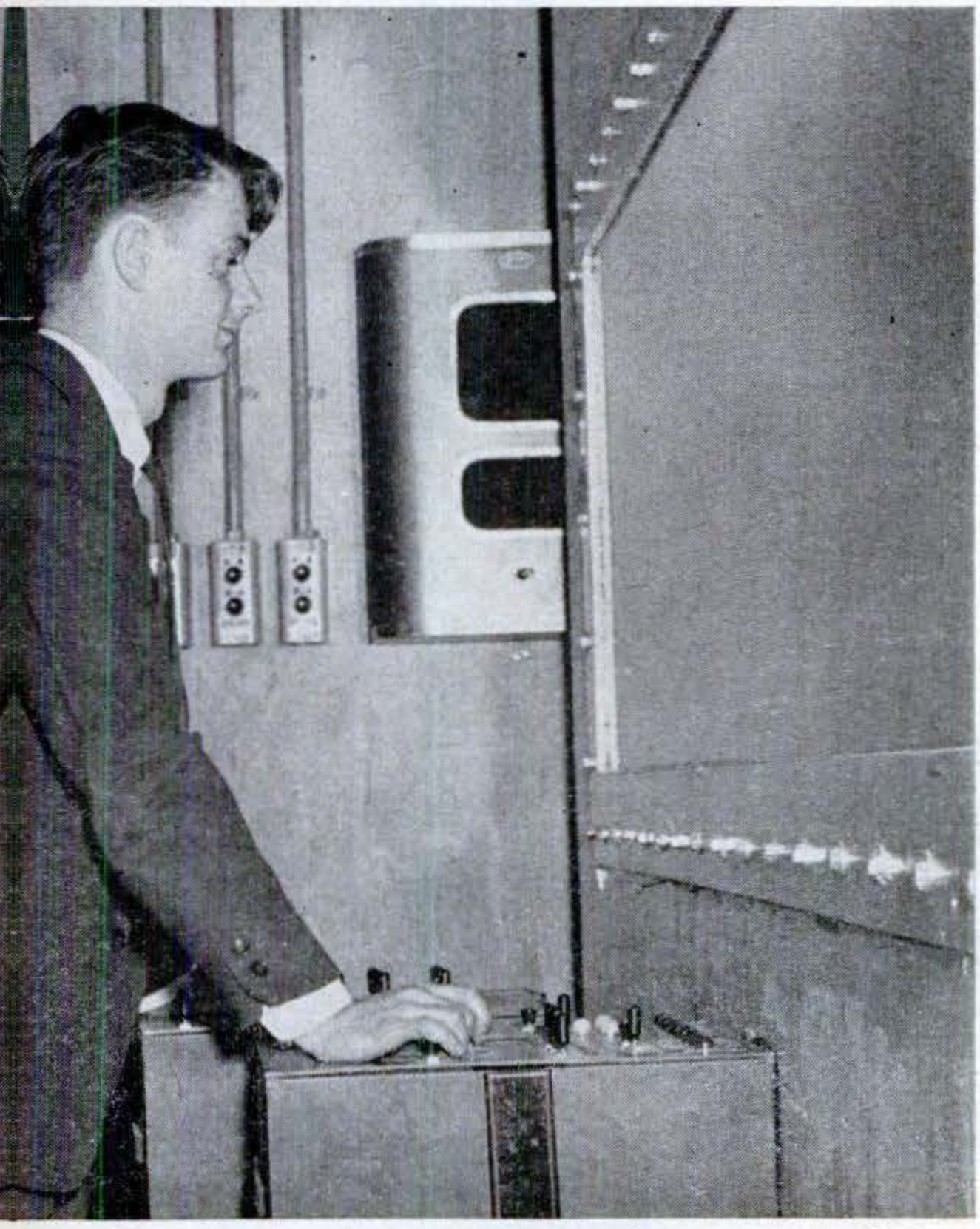
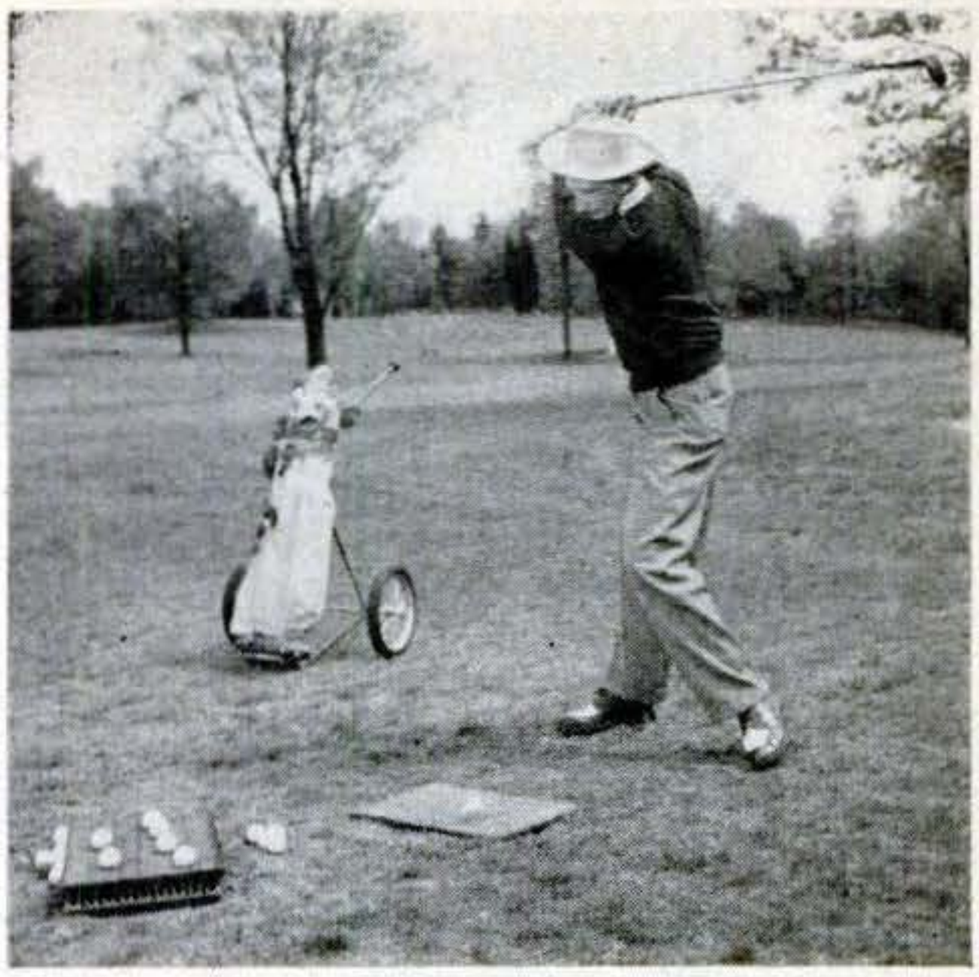


Panel on dolly lets operator work along with mechanical handy man in areas of mild radioactivity. Big mirror, adjusted by remote control, keeps hand in view of operator at all times.



For really hot work, robot is operated from shielded room. Signal lights on controls connected to feelers on hand tell when hand is in right position. Operator need not see work.



Brushes Make Golf Turf

THE practice golf tee above is the newest Fuller brush. A mat of green, water-resistant Tampico fibers, it has the appearance and texture of natural turf. Eighteen replaceable brush strips, gripped in steel channels, fit into magnesium holders that are fastened to a hardwood base. The Turfmaster may be buried or set into a platform.

Toe Triggers Transplanter

TRANSPLANTING small-stemmed plants is easy with this new garden tool, the Press-Toe. A hole is dug by pressing a square cup into the soil, as at left. The tool is then pressed into the earth around the plant to be moved (right). With the plant lifted out, a flip of the toe drops it into the hole. Pearne and Lacy Machine Co., Los Angeles, sells the tool for $2.95.

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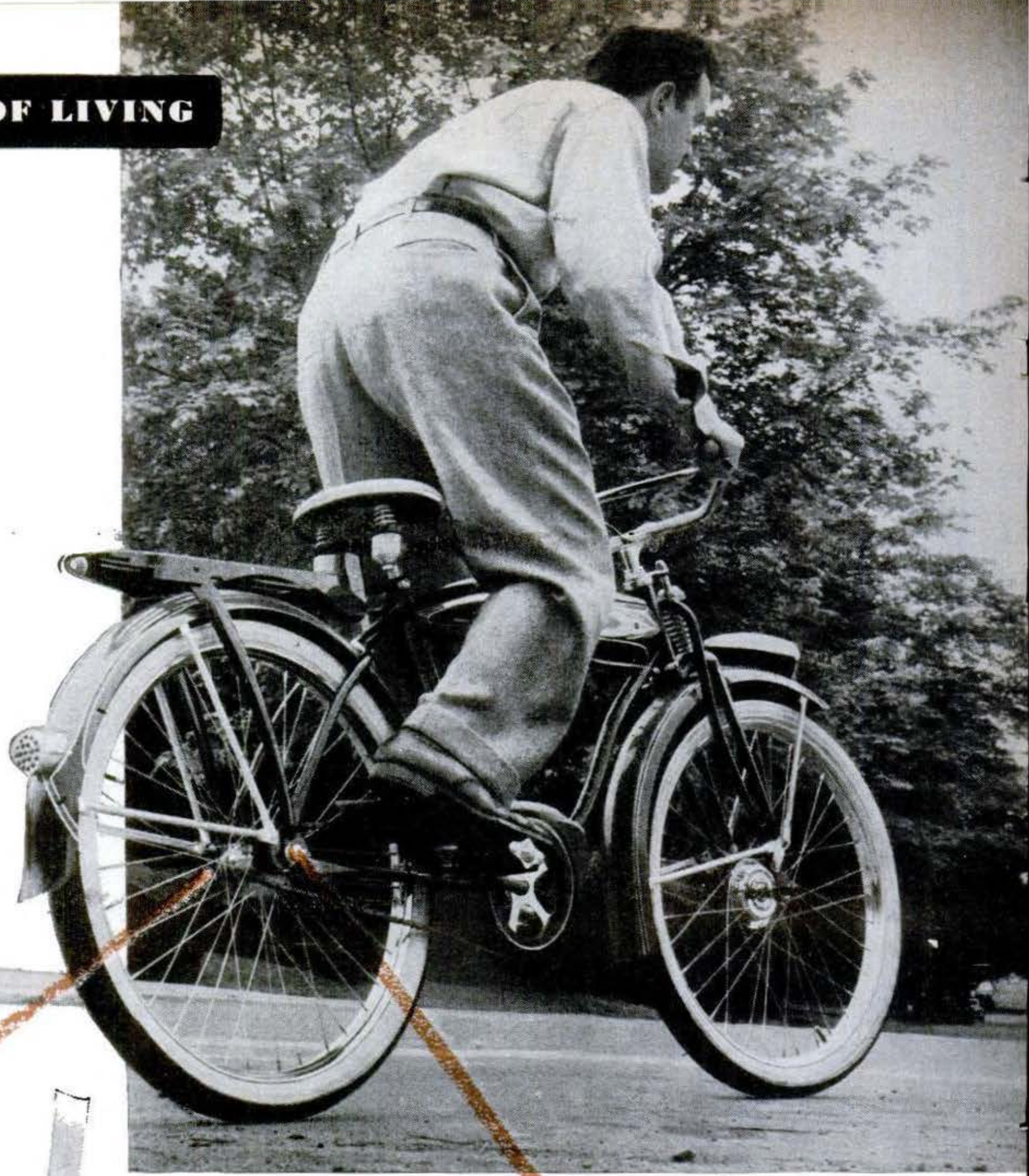

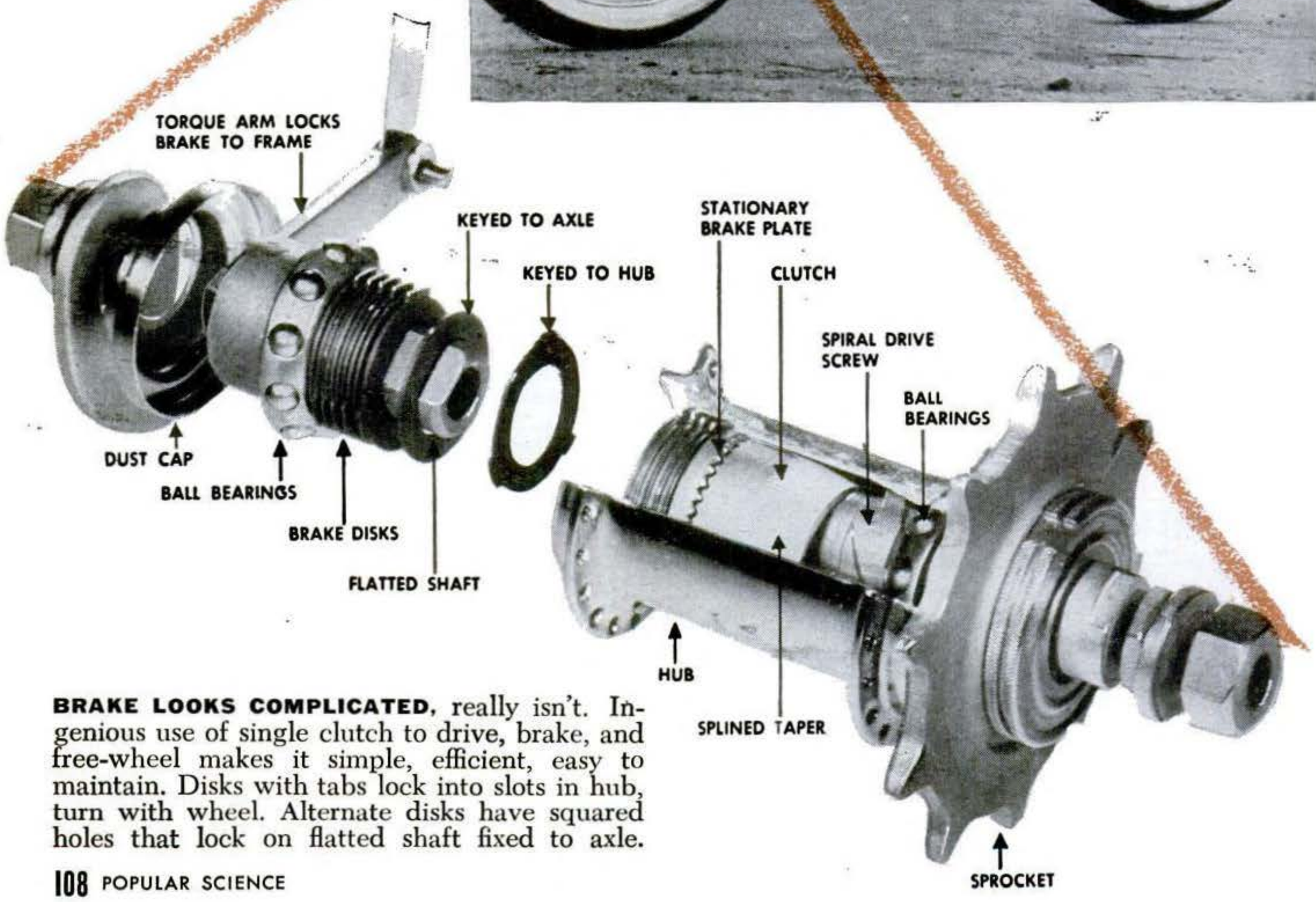

BRAKE LOOKS COMPLICATED, really isn't. Ingenious use of single clutch to drive, brake, and free-wheel makes it simple, efficient, easy to maintain. Disks with tabs lock into slots in hub, turn with wheel. Alternate disks have squared holes that lock on flatted shaft fixed to axle.

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How a Coaster Brake Stops a Bike

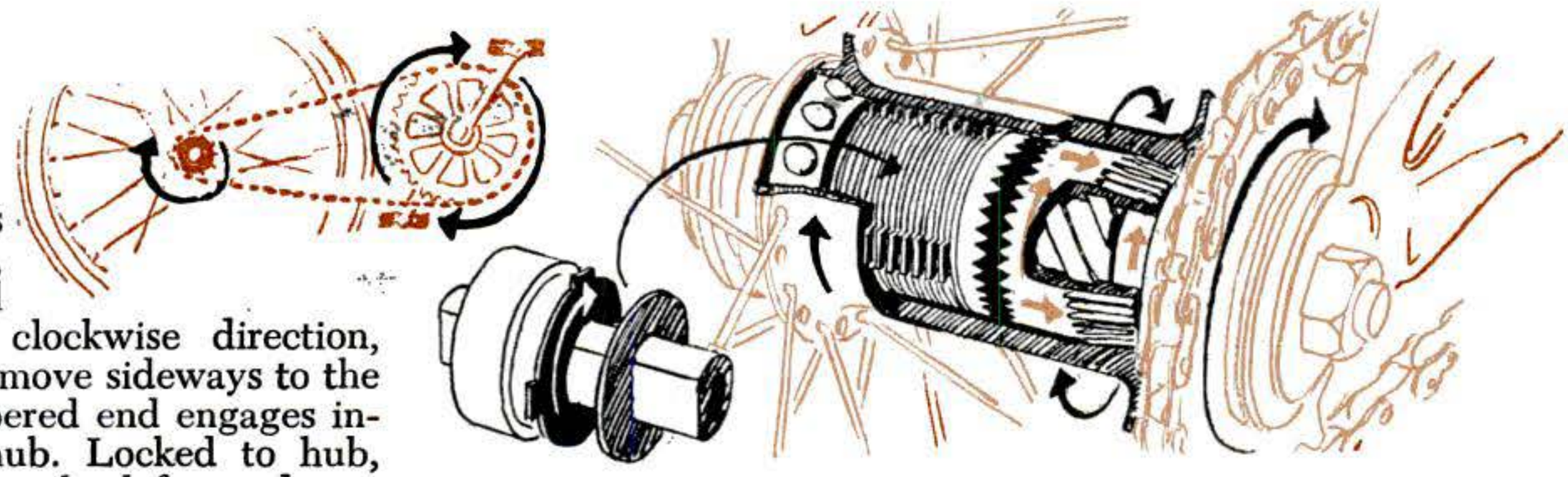
By Sheldon M. Gallager

EVERY time your bike-riding youngster slams on the brake on a steep hill or at a traffic crossing, a small but powerful mechanism inside the rear-wheel hub brings the bike to a fast, safe stop.

This intricate device is the coaster brake known casually by two generations of present and former teen-agers. It consists of a cone-shaped clutch sleeve that rides back and forth on a spiral drive screw, turned by the sprocket. When the clutch moves to the right, it engages the wheel hub, driving the bike. When it moves to the left, it engages the brake. In between, it engages neither, and the bike is free to coast.

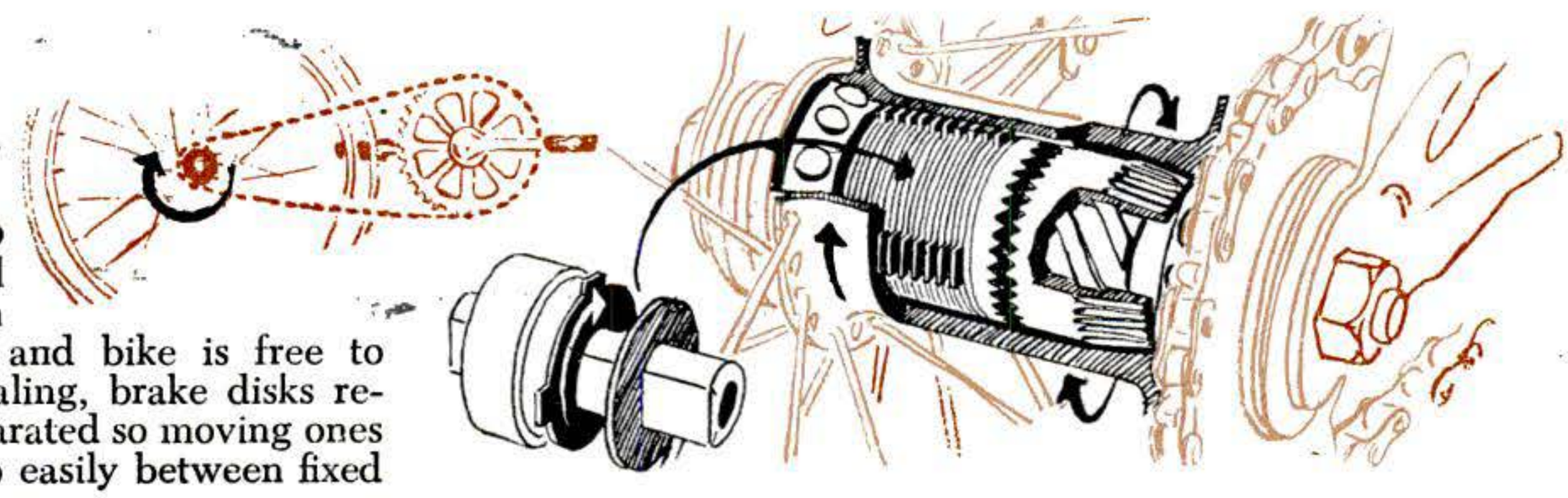
In the New Departure model shown, the brake mechanism is an ingenious arrangement of 21 steel disks. Eleven disks are keyed to the axle, which is held stationary by a torque arm secured to the bike frame. The other 10 disks are keyed to the hub and rotate with it. When the clutch squeezes the disks, the fixed ones pinch the rotating ones, slowing the bike. END

PEDALING



WHEN PEDAL is pushed forward, it turns spiral drive screw in clockwise direction, forcing clutch to move sideways to the right until its tapered end engages inner surface of hub. Locked to hub, clutch then turns wheel forward.

COASTING



WHEN FORWARD pressure on pedal is released, clutch disengages hub, and bike is free to coast. As in pedaling, brake disks remain slightly separated so moving ones keyed to hub slip easily between fixed ones keyed to axle.

BRAKING

WHEN PEDAL is pushed backward, it turns drive screw counterclockwise, forcing clutch to the left against fixed brake plate. Locked against turning, clutch then compresses disks, pinching moving ones between fixed ones to slow bike.

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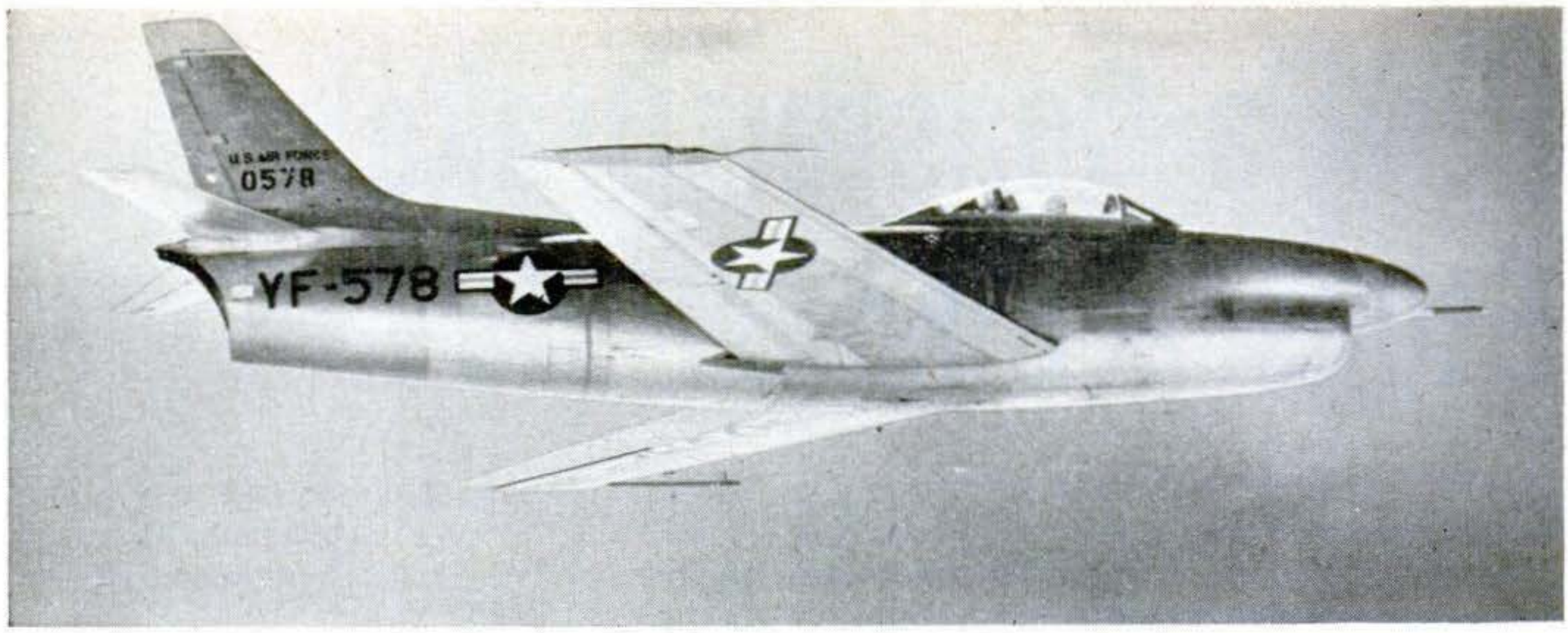
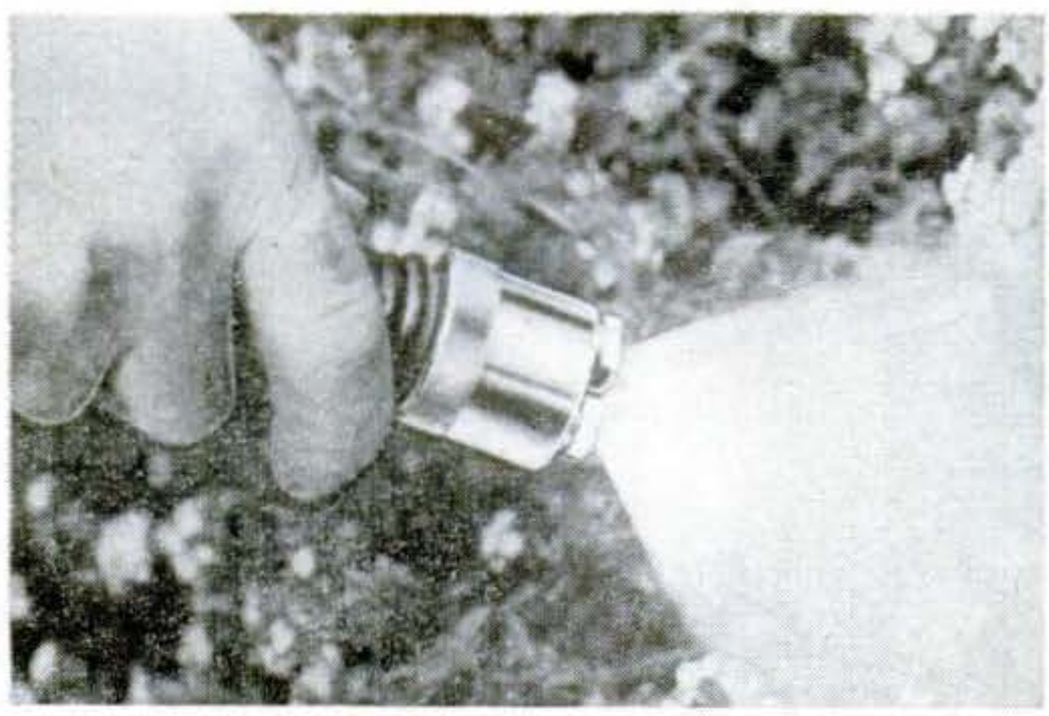


Record-Breaking Jet Fighter Gets Big Twin

THE new Air Force F-95A interceptor above is expected to outperform its smaller brother, the North American F-86 Sabre that holds the world's speed record of 670 m.p.h. A more powerful J-47 jet engine, housed in a fatter fuselage, plus an afterburner, give quick climb. Air-intake duct is under a longer nose that holds radar.

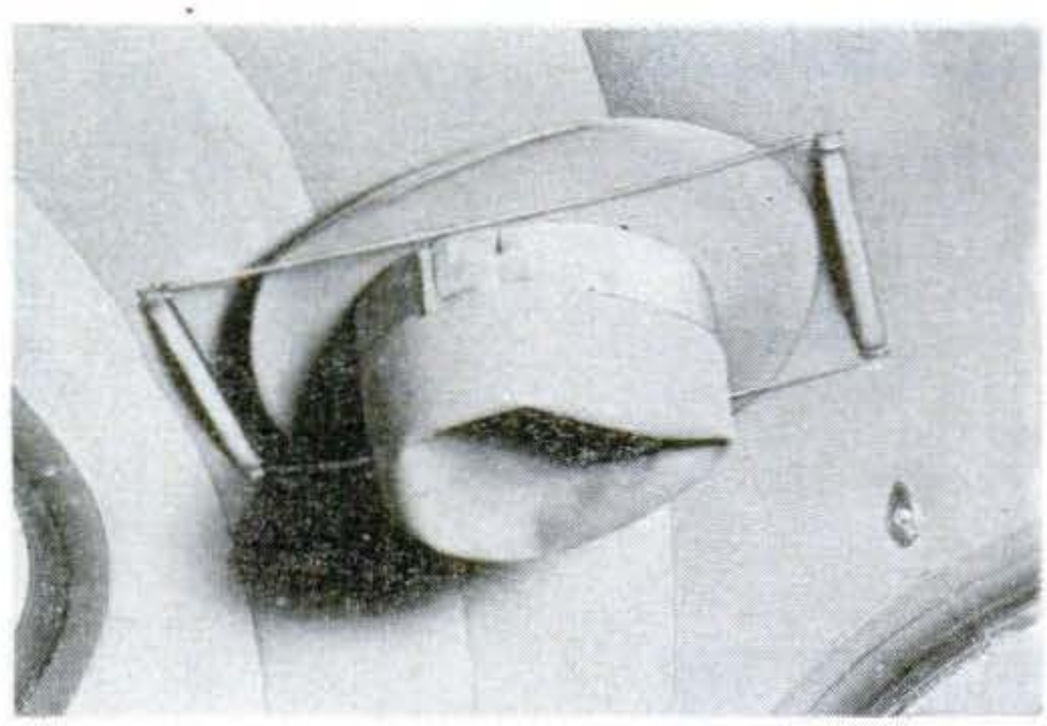
Box Spreads Mortar Evenly

TURN the crank handle of the steel box at right, and it rides along a wall on small wheels, forcing out behind two small streams of mortar that are spread evenly. Helper follows, putting the building blocks in place. The inventor, Jack Wegner, of Pullman, Wash., turning the crank of his machine, claims it will eliminate costly waste. Using ordinary methods, he says, the mortar is spread on thickly and unevenly, with more than half oozing out between the blocks and dropping to the ground.



Nozzle Sprays Foglike Mist

THIS brass garden-hose nozzle, for spraying seed beds and young plants, atomizes water into a gentle, foglike mist that won't wash away soil or fertilizer. Available from Fogg-it Sales Co., Downey, Calif., for $1.95, the nozzle has a three-hole spray head.



Hatrack Pins to Car Top

The elastic-wire hatrack above is a convenient holder for your hat, maps, or box of cleaning tissues while driving. It is easily installed on the inside roof of a car by pins attached to the end bars. The Auto Hatrack Co., Denver, Col., sells it for 69¢.

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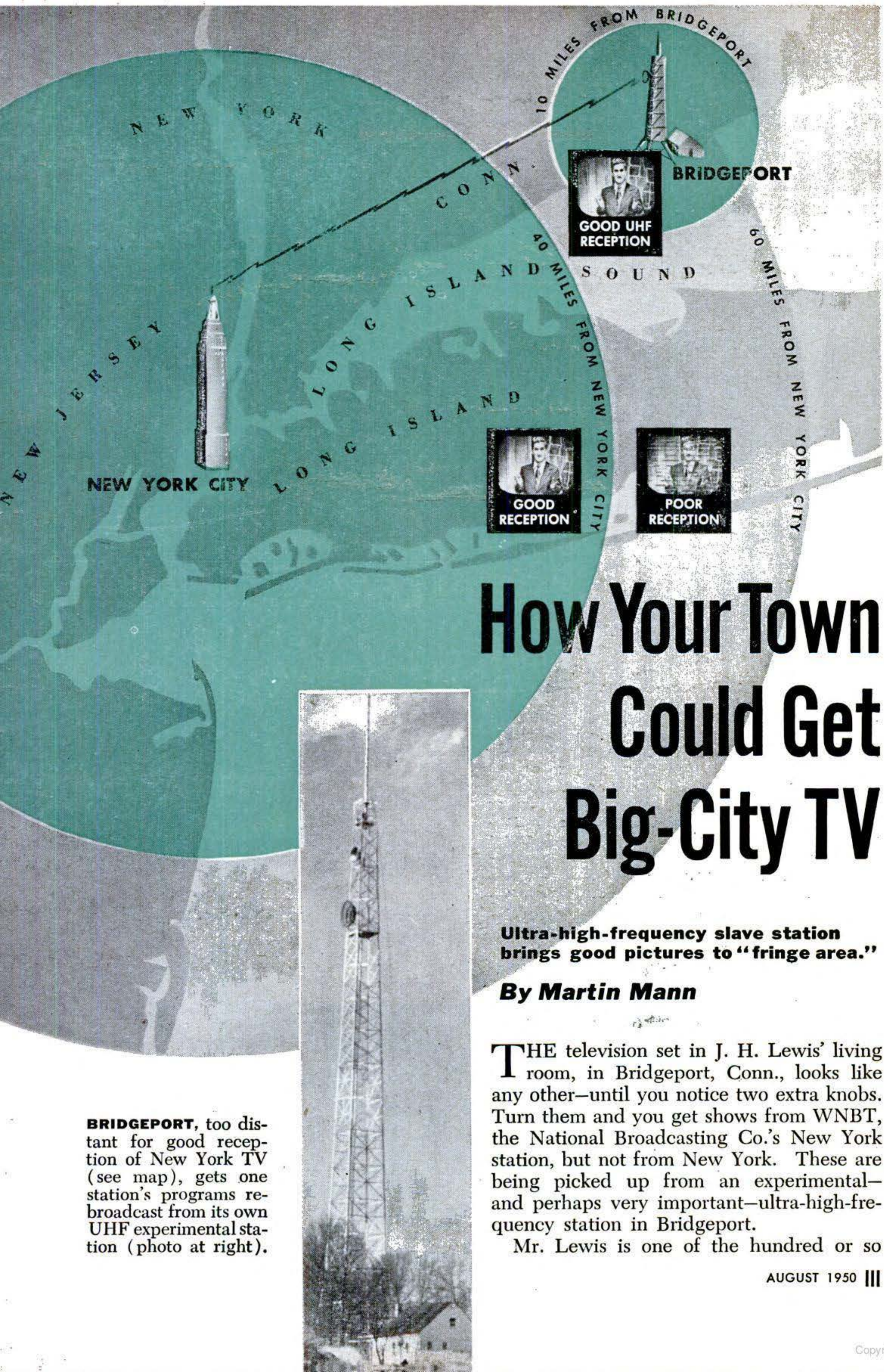

How Your Town Could Get Big-City TV

Ultra-high-frequency slave station brings good pictures to "fringe area."

By Martin Mann

BRIDGEPORT, too distant for good reception of New York TV (see map), gets one station's programs rebroadcast from its own UHF experimental station (photo at right).

THE television set in J. H. Lewis' living room, in Bridgeport, Conn., looks like any other—until you notice two extra knobs. Turn them and you get shows from WNBT, the National Broadcasting Co.'s New York station, but not from New York. These are being picked up from an experimental—and perhaps very important—ultra-high-frequency station in Bridgeport.

Mr. Lewis is one of the hundred or so

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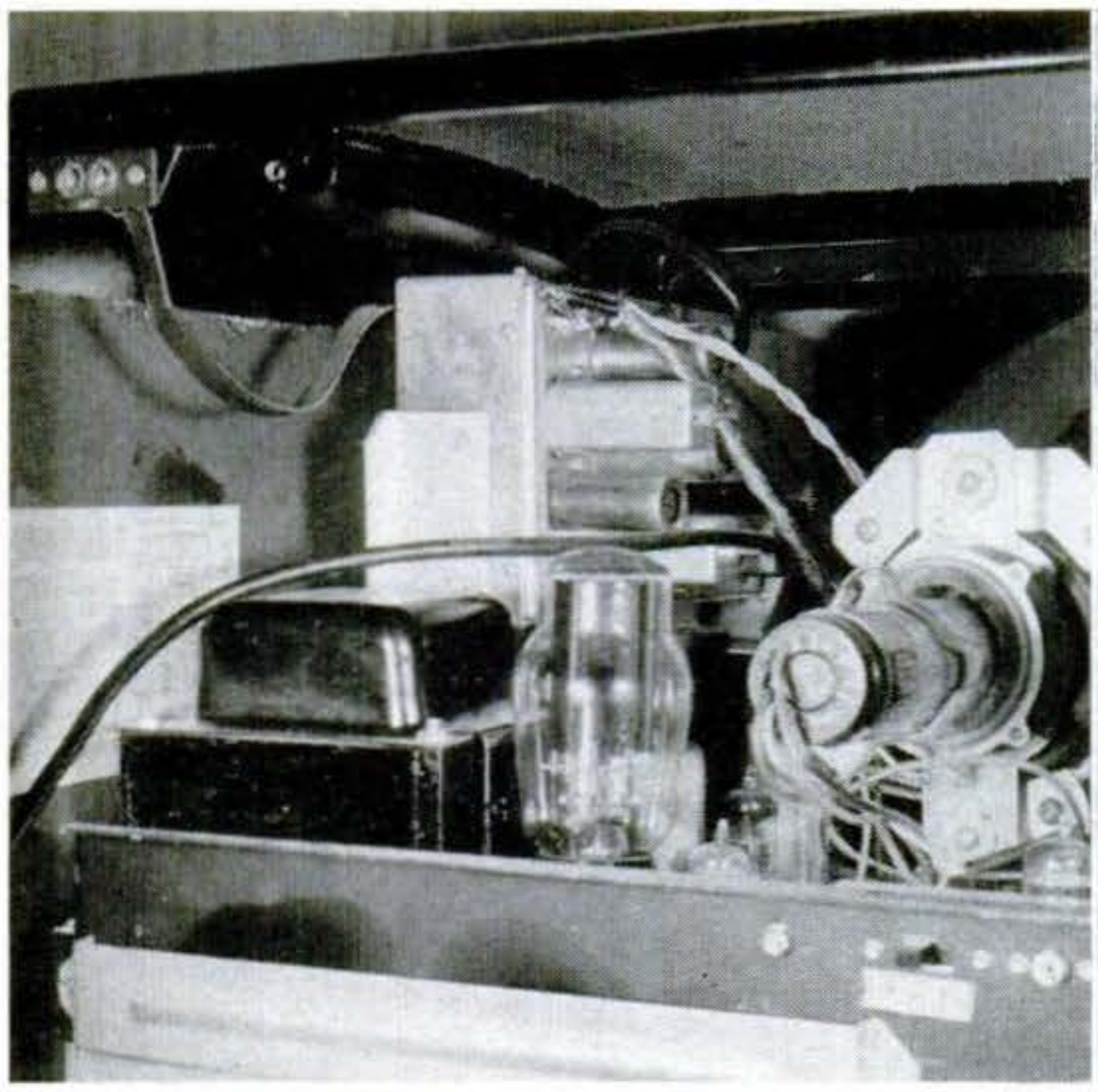
people cooperating with RCA in the first big test of UHF television—a test that may determine the future of television. For UHF promises to bring good video reception to people who now can't get it.

Take Bridgeport, for example. There are 200,000 people in that area, apparently all crazy about television. But they are some 50 miles from New York, just beyond the region of good reception. To pick up New York they must often spend up to $100 for antennas on tall masts.

And what they get for their money is apt to be poor indeed. Some stations fail to come through at all. Those that do usually give bleary pictures badly broken up by interference. It's like watching a show through a car windshield smeared with mud.

Why don't Bridgeporters build their own stations, then? That's where UHF comes in. With UHF, they could. Without UHF, they couldn't.

The reasons are complex enough to give the Federal Communications Commissioners



ABILITY OF UHF to cover area is gauged at various heights with antenna mounted on extension ladder (right). Truck carrying ladder also tows instrument-loaded station wagon. Test equipment includes standard TV set converted to receive UHF (below). Two extra knobs on upper right face of set are only visible change. Converter itself is inside cabinet (it is shown on its side in upper center of photo above). This conversion job is one of two types RCA has installed in about 100 private homes in theBridgeport area.

the harried look of a TV-set manufacturer who bet his bankroll on seven-inch screens. As the radio space is now divided up, a part of the very-high-frequency range (54 to 88 and 174 to 216 million cycles) is allotted to television. This provides room for only seven television stations in any one area. All seven are built and operating in New York. Nobody can build another one within about 80 miles—interference would be hopeless, since the radius of severe interference is about twice that of useful reception. So Bridgeport is out of luck.

But farther up in the radio space, the *ultra* high frequencies are not yet divided up. Tentatively, the space between 470 and 900 million cycles has been assigned to experimental TV—enough room for a couple of dozen video stations. So Bridgeport—or anybody—could have a UHF station without getting into its neighbors' hair.

Bridgeport May Tell the Story

UHF is still largely unexplored territory, however. Nobody is sure just how receivers and transmitters up there should be designed, what kind of antennas to use, how far a good signal can be broadcast, what effect weather has, or the answers to a list of other questions.

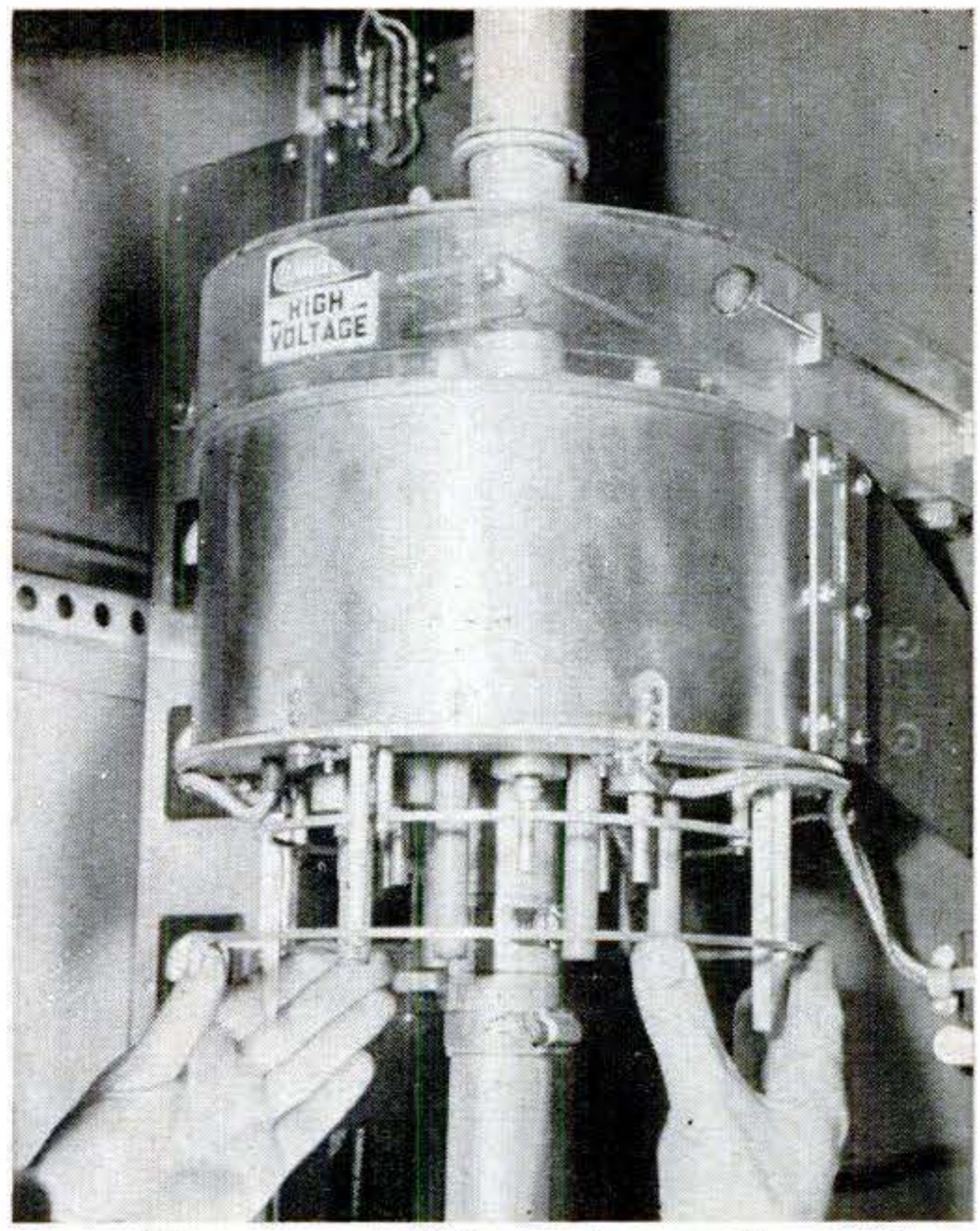
Some of these answers RCA hopes to get from the Bridgeport test. Two other experimental UHF transmitters are also being operated by different organizations, one in California and one in the Midwest.

Bridgeport's guinea-pig station, KC2XAK, looks deceptively standard. A white cottage nestles in the shadow of a 250-foot antenna tower atop one of the hills overlooking the city. Inside you see a control console and shiny metal cabinets of equipment similar to those in any TV station.

For, actually, the transmitter equipment is a standard RCA type modified for UHF. The most noticeable change is the addition of big tubes—similar to those used for radar—that provide the ultra high frequency by doubling their input frequency. Identical tubes provide final amplification.

KC2XAK is unusual in another way: it has no studios. There's not a single television camera and only one microphone—in a storage closet—for station-identification announcements. For this station is a "slave," simply rebroadcasting the programs of its "master," in this case WNBT of New York.

Pictures are relayed over a microwave link from WNBT's Empire State Building transmitter station to a dish antenna near the top of the Bridgeport tower. The sound is simply picked out of the air by a regular TV receiver and rebroadcast.



TUBE like ones used for radar produces ultra-high-frequency waves. It is tuned by changing size of cavities (above). Except for these special tubes, transmitter is largely standard.

This slave, or satellite, operation is a major part of the Bridgeport experiment. Costing only a small fraction as much as a standard TV station to set up and run, it is showing one way to bring video within the reach of smaller communities. Of course, a slave could choose its programs from several masters, instead of always rebroadcasting one, as KC2XAK does.

KC2XAK serves one of the most exclusive audiences in the TV world. Only about 100 people have sets equipped to pick it up. A few use specially designed UHF receivers. Most of them, however, have simple converters attached to the standard TV sets they already owned. The converters, UHF antenna installations, and service are supplied free by RCA. In return, the householders like Mr. Lewis fill out reports on the quality of the UHF reception, and put up with frequent calls from service men, engineers, and visiting firemen like your POPULAR SCIENCE reporters.

RCA has designed two different types of converters. One is a complete UHF

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"front end." It picks up the UHF signal and feeds it to the intermediate-frequency circuit of a standard set, by-passing the standard front end. This type, concealed inside the cabinet, is the one Mr. Lewis has.

The other type, called a Pan converter after its inventor, Dr. T. Y. Pan, merely reduces the ultra high frequency to the frequency of one of the standard TV channels (channel 12 in the Bridgeport test). The signal then goes into this channel on the set and passes through the entire set in the normal way. Both units, using about five tubes apiece, provide some extra amplification. RCA won't talk about price.

Although RCA operates the UHF station, other companies are using its broadcasts to test their receivers. Zenith, in particular, has set up about a dozen UHF-adapted sets in homes in the area. These sets, a type already on the market, are converted by simply adding one coil to the tuning unit.

When commercial UHF television will come depends on several things. Many tests like the one in Bridgeport must be completed. The decision on color might also have an effect, for the Federal Communications Commission may want to set aside some UHF space for color-only stations.

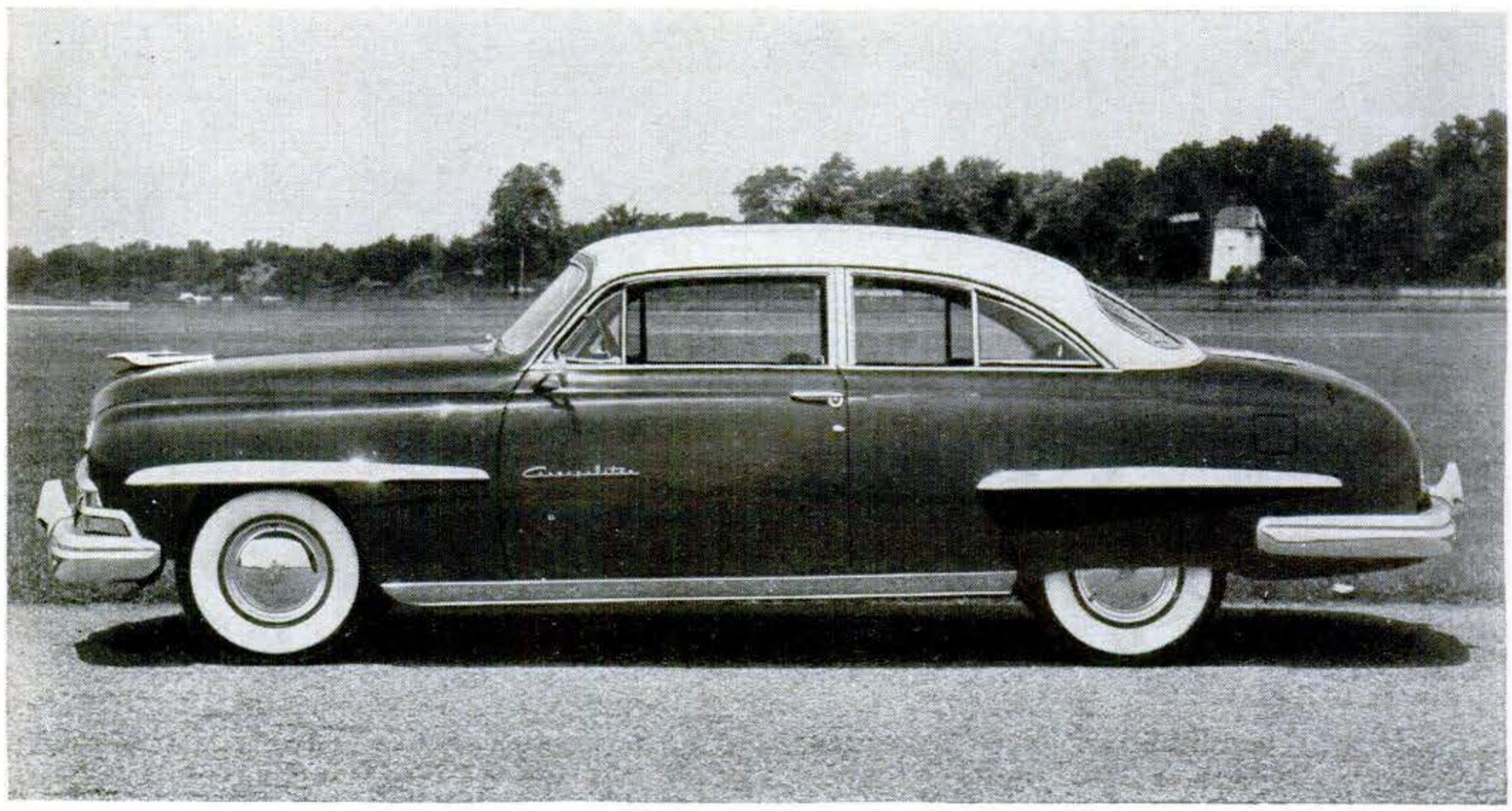
How good is UHF television? The Bridgeport experiment is only seven months old, so final results can't be expected yet. Thus far, transmission seems simple enough. KC2XAK, run by only one operator, has encountered no serious trouble.

Reception is good. Pictures are as clear and steady as standard TV gives in New York City itself. But this is true only close to the transmitter, even though it is several times as powerful as most TV stations. Pictures RCA classes as "good" are now rarely received beyond about six miles (standard TV covers a 40-mile radius quite easily). But antenna design and location are even more important for UHF than for standard TV, and better installations may extend this limit.

The short range of UHF might really be an advantage. Transmitters could be located fairly close together without interference, making it possible for almost every town to have its own station. Then television for everybody, everywhere, would be in sight—technically at least. END

Hard-Top "Convertibles" Have Customized Styling

THE Lincoln-Mercury division of Ford is now marketing three new hard-top "convertible" coupes for style-conscious motorists who like cars with distinctive appearance. The "customized" cars feature vinyl-plastic tops over the standard steel tops, extra chrome trim, fancier instrument panels, two-tone leather upholstery, and special color schemes. They have special names, too—the Mercury Monterey, Lincoln Lido, and Lincoln Cosmopolitan Capri (below). All three have special steering wheels and twin outboard rear-view mirrors. They are slightly higher in price.



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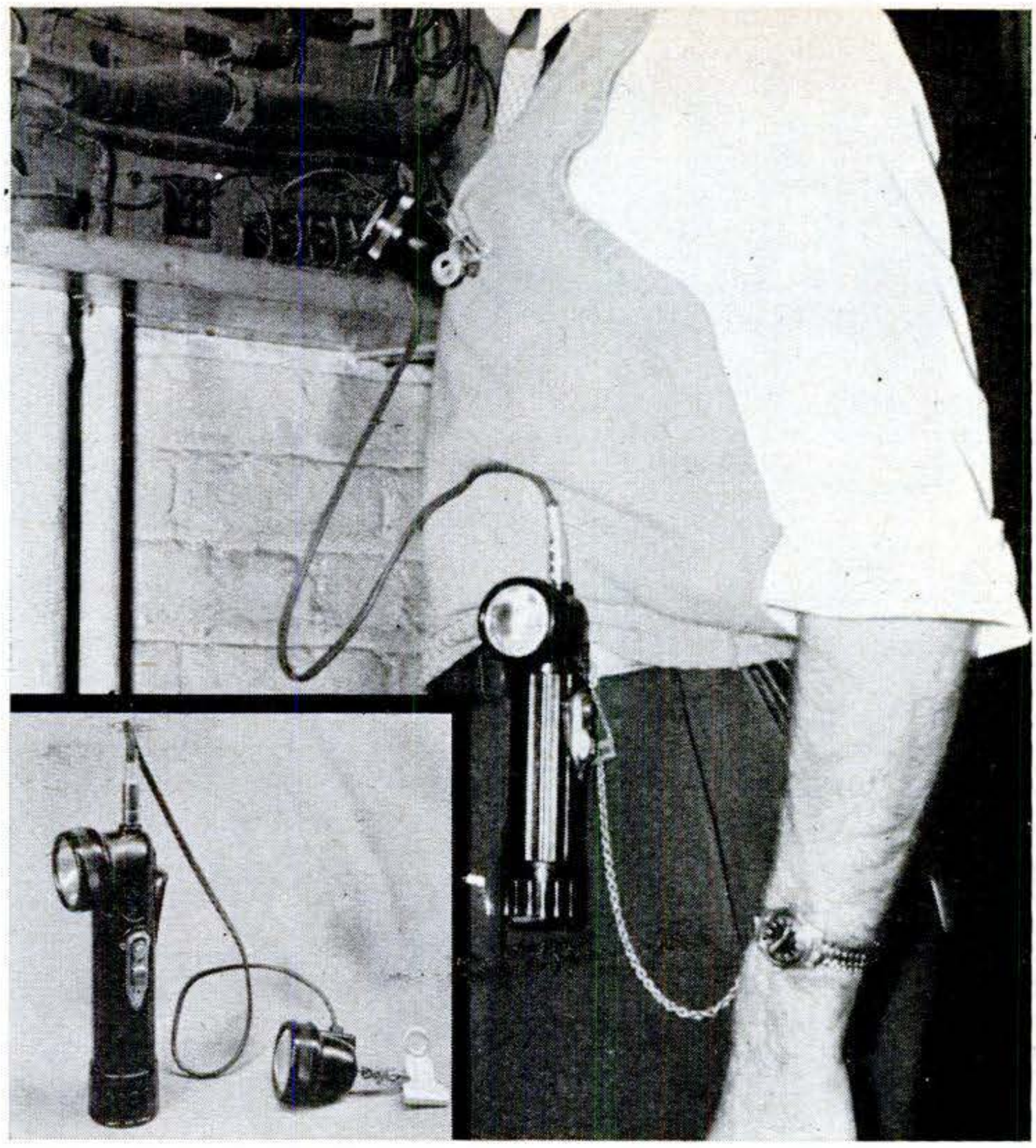
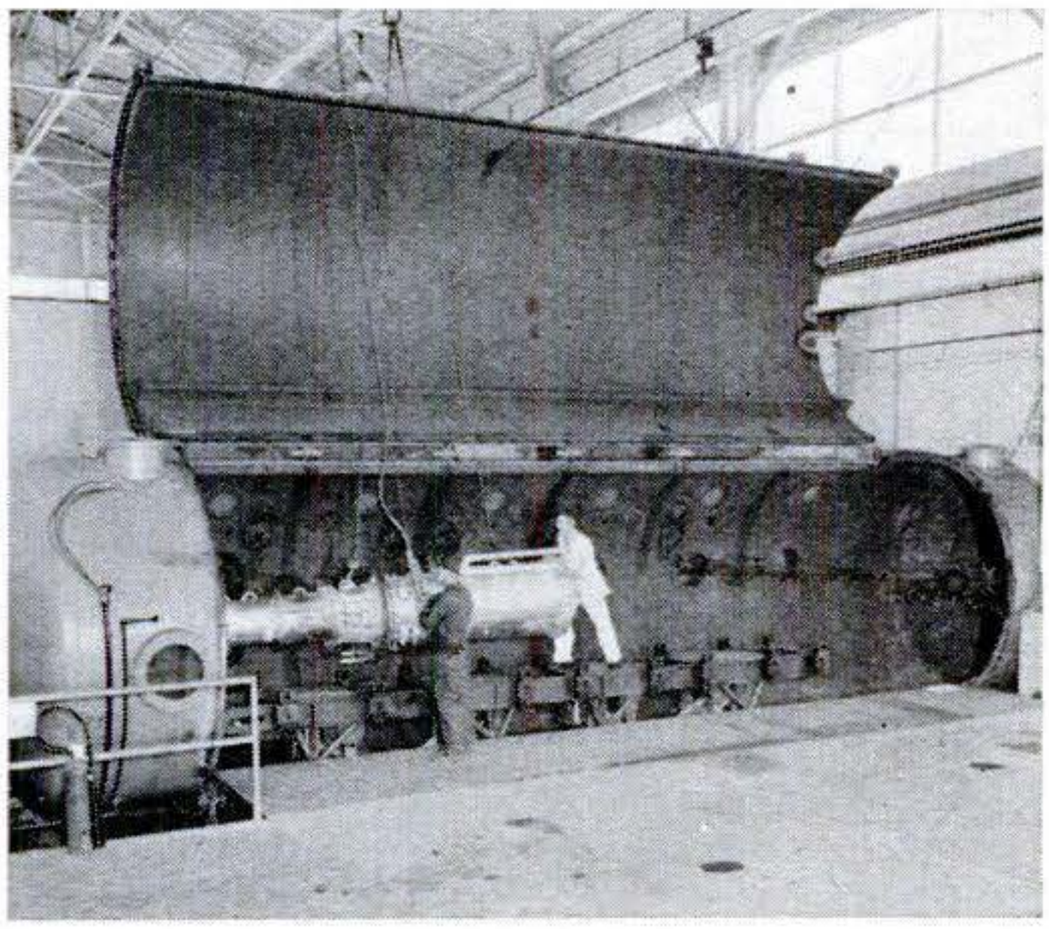
Flashlight Shines Two Ways

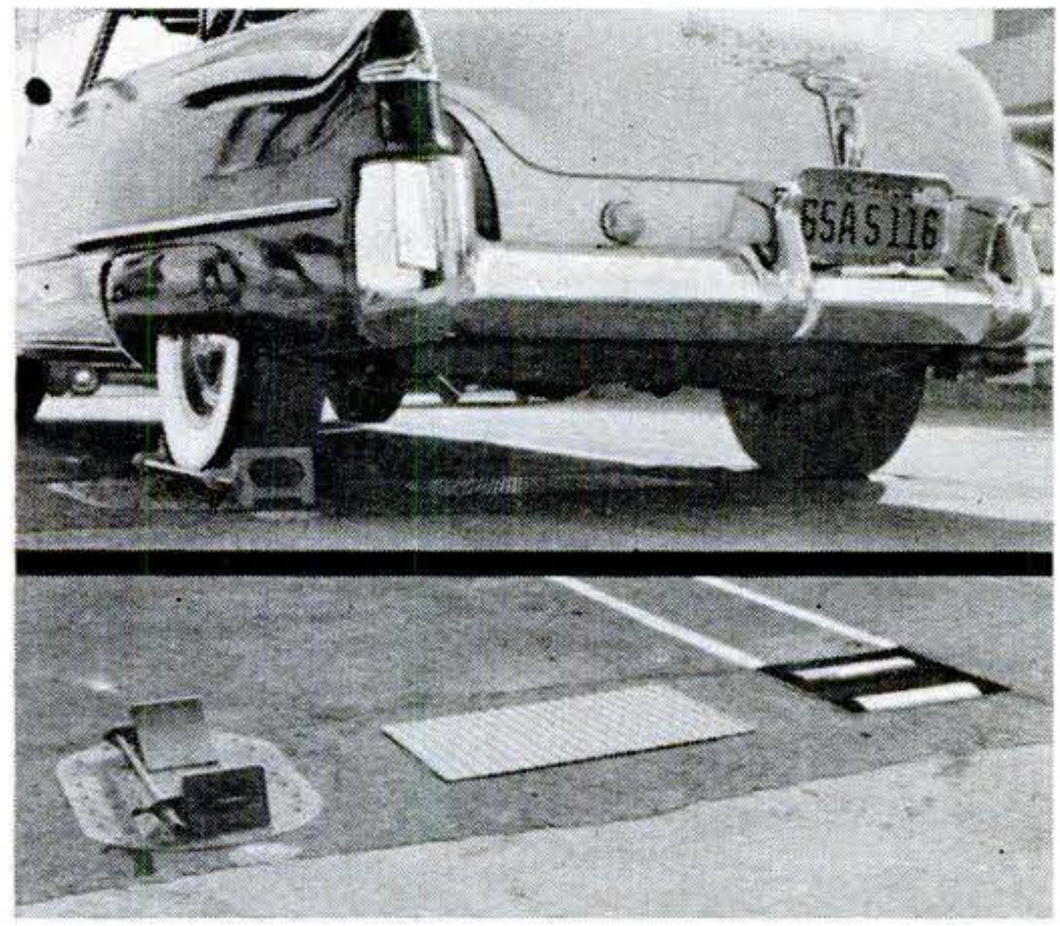
A TWO-HEADED flashlight, shown in use at right, is the telephone repairman's newest tool. The case is like an ordinary flashlight's except for a socket into which you can plug a 3½-foot extension cord feeding a second lamp. Both lights draw power from the two standard cells in the flashlight. The extension, with a floodlight lens, is swivel-mounted on a spring clamp that can be hooked to the user's clothing or any convenient structure. The flashlight itself, with a belt clip, serves as a spotlight. Bell Telephone Laboratories designed the double-duty light, and Gits Molding Corp., Chicago, makes it.





Ramjet Flies High on Ground

THIS full-scale ramjet engine is being lowered into a test chamber that can take it on simulated "flights" 20 miles up and at speeds four times faster than sound. Developed at the Navy's Ordnance Aerophysics Laboratory in Texas, the chamber, first of its kind, is 125 ft. long and 10 ft. in diameter. Steam for its vacuum system would supply electricity for a city of 100,000; 30,000 gal. of water a minute cool it.



Car Bouncer Spots Squeaks

THIS device, imbedded in a concrete floor, allows a mechanic to locate the source of rattles and squeaks in a car by simulating road conditions without leaving the garage. The left-hand unit holds one rear wheel secure, while the other wheel rotates between two steel rollers. One of these has bumps in it that jounce the car as would a rough road. The apparatus is made by the Western Tool and Engineering Co., Los Angeles.

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Road racers, bunched at the start, above,

Road Race

Slithering around a loop of twisting roads, these agile sports cars compete in a revival of early highway races.

By Bill Reiche

PS PHOTOS BY W. W. MORRIS

IF AMERICAN stock cars of 1955 are better performers than current models, I vote we credit a thousand gentlemen amateurs who are intensively seeking to "improve the breed" of automobiles.

They are sports-car drivers, who several times a year conduct road races to prove that an automobile may be a thing of swift performance, rather than the spongy, soft-riding child of chrome mated with bulge.

Racing against each other and the inexorable sweep of a stop watch isn't all sports-car drivers do. You've probably seen them darting along the highways in their beautifully engineered cars. In these watch-charm racers they often seem to be going much faster than they are. Motorcycle cops tend to jump to the conclusion that, because a sports car is capable of bettering 100, it does so constantly. Actually, sports-car drivers as a group don't attempt top speeds on traveled roads any more than Lily Pons feels it necessary to hit her top note when calling a cab. Everybody knows they *can* do it.

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soon spread out. The Ferrari, far left, won, and the Frazer-Nash, foreground, was third.

Tests Both Cars and Men

However, several times a year in different parts of the country the man with the heavy accelerator foot does have his day. Then, under conditions of maximum safety for driver and spectator alike, he gets his chance to open her up in a road race. This is a flavorful kind of competition, older and more exacting than circling a race track.

More than 80 drivers and cars were entered in recent races at Bridgehampton, New York, where I watched them compete in six classes over a closed, four-mile stretch of two-lane road. On such an occasion even the uninitiated may see why some overseas manufacturers lavish loving care on building precision mechanisms, why owners in-

Skilled mechanics go all out trying to complete the installation of a new engine in a Meyer Special the night before the race. They did and it placed second in its classification.

An Austin driver offers his crash helmet for approval at the inspection station. His goggles must also get an okay from AAA officials.

The sports car that brought the driver to the scene takes on the appearance of a racer when its identifying number is sprayed on.

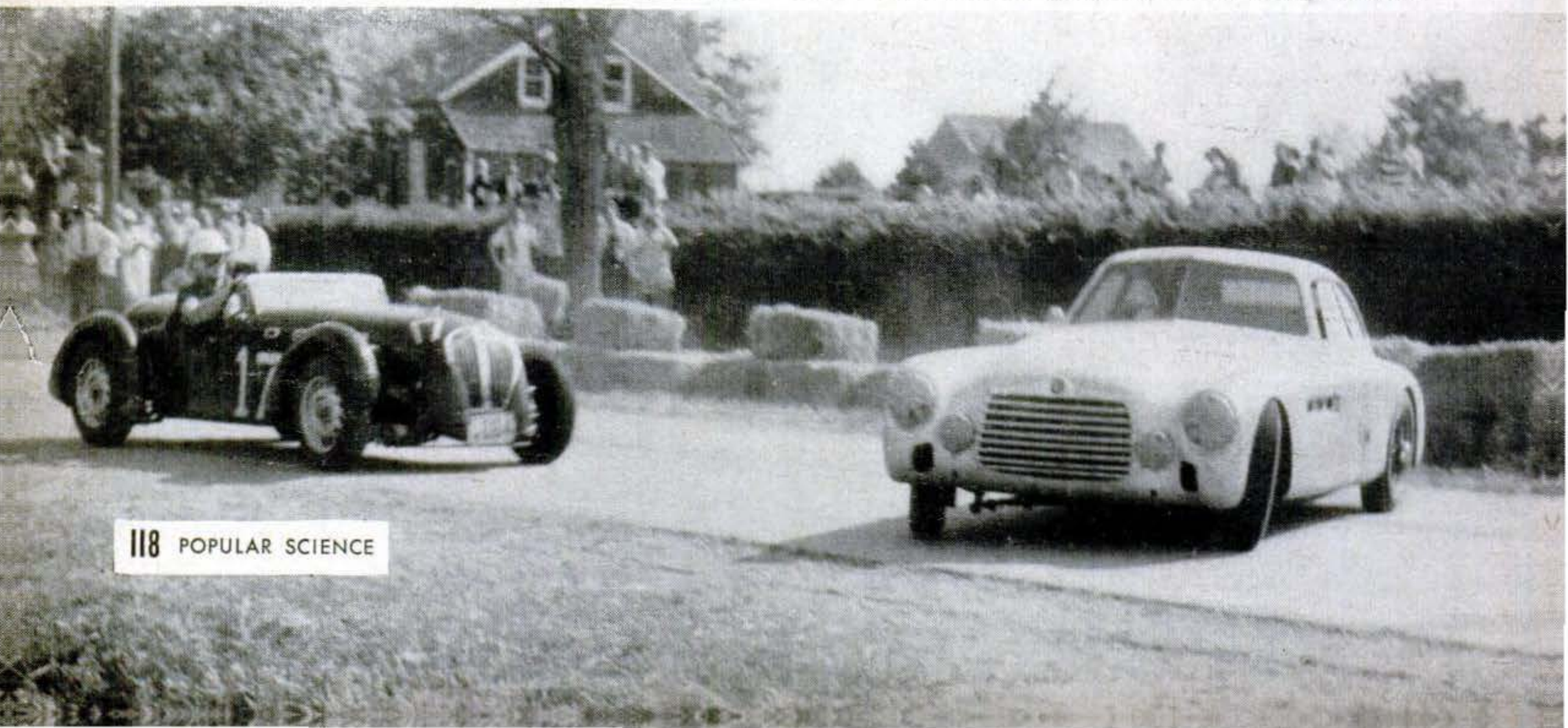
A Healey fails to come out of a turn as planned and plows through the protective bales of hay, dislodging a fender. The car was pushed back on the road and finished the ten-lap race.

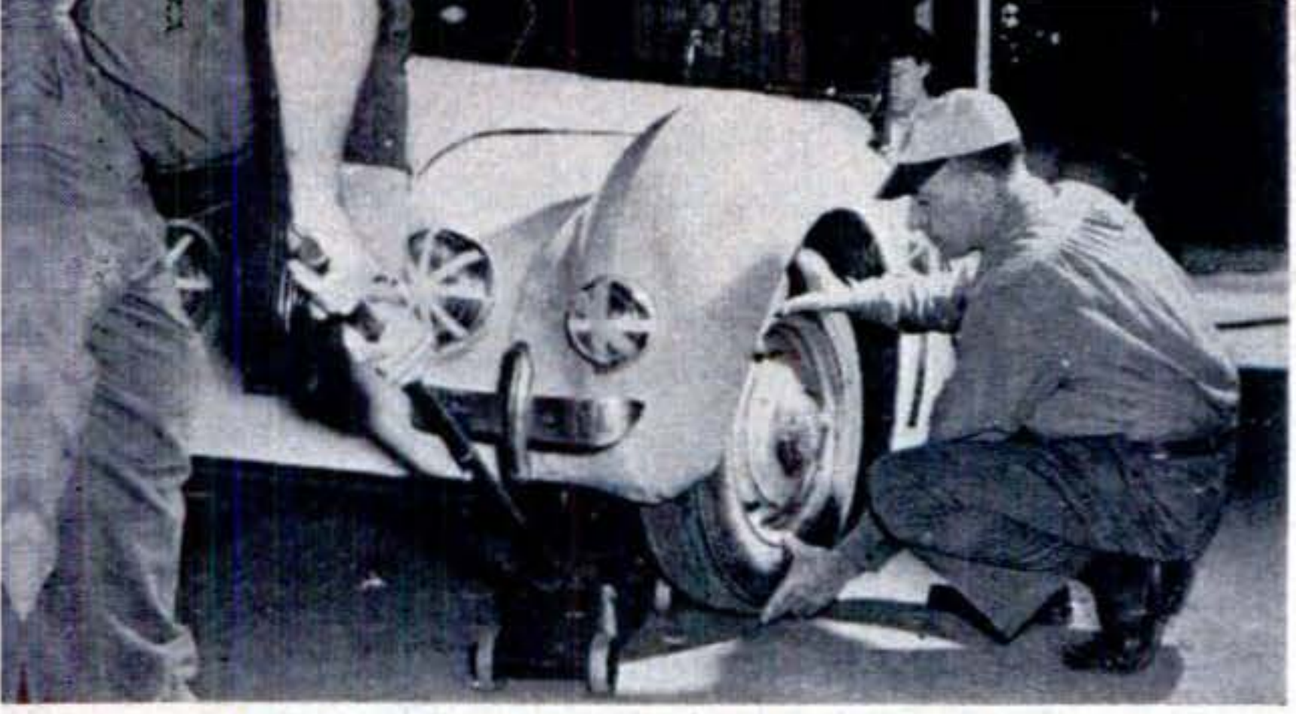
vest substantial sums in them, and why drivers risk their necks in hot competition.

A road race is a spectacle that appeals to practically every one of the senses. The cars have a cool, functional beauty that bespeaks quality and class. The straight pipes of their exhausts mutter modestly that here are engines tuned with loving care; then scream it out like boastful small boys as they accelerate. These racers have the smooth, solid feel of a stake horse in the paddock. They smell like automobiles anywhere, except for the oldsters that still use castor-oil lubrication. You can even taste the race when a car on the shoulder of the road envelopes you in tar-flavored dirt.

Drivers and cars must meet high standards of fitness. The American Automobile Association, under whose jurisdiction the races are run, registers the men (women are barred from road racing) after a driving examination. They must sign waivers

The same car, left fender gone, comes around the same turn later and appears to be headed for a broadside collision with an Alfa Romeo that is coming out of a spin. The AR, driven by Antonio Pompeo, who is one of the oldest drivers in road racing, was no sitting duck in this instance and went on its way unscathed to nail down second position in its classification.





Perfect steering mechanism is essential for the safety of drivers and spectators. Here wheels are carefully checked on a Healey. Note that driving, parking lights are taped.

clearing the sponsors from responsibility and carry heavy insurance to cover spectators and themselves in case of a mishap.

An official inspection station checks the cars. Lights must be taped, and reversed if possible, to minimize the danger of flying glass. Emergency brake, stop lights, and horn must be in good operating condition (though few drivers could hear a horn during a race). A safety belt must be fastened to the frame of the car, rather than to the seat, door latches must be secure; and running gear and fuel tanks must pass close scrutiny.

In most races fuel is tested to guard against speed-inducing alcohol mixes. At Bridgehampton, because of the heavy entry list, it was not possible to check the fuel. Drivers were put on their honor. If this seems naive, it must be remembered that sports-car racing is considered by its participants to be a gentlemen's sport. This is not

Driver's pit crew watch the road and a stopwatch. Number on sign held by man at left indicates laps completed; a lower number, not visible, indicates his position in the race.

meant as snobbery; the emphasis is on amateurism—sport for the sake of sport.

The day before a race, action starts cracking. Drivers, eager to become familiar with the roads, curves, and corners, "burn the course" interminably. Between "burns" the drivers tinker, kid each other about their skill, luck, and natural depravity, and try to worm out secrets for making cars go faster.

"Wonder how Smith is getting along with

So great is the acceleration of this winning Cadillac-powered Allard that as it straightens out from a turn its sheer power lifts the front wheels from the ground. With these cars, noted for road-holding ability, this is a rare occurrence. This car exceeded 100 m.p.h. on the short Bridgehampton straightaways and won easily. Note air intakes projecting through hood.

that hoodoo wagon?" one will ask concerning a car that hasn't proved itself. "Hear Doakes has his M.G. blown," says another, meaning that Mr. D. has put a supercharger on his car. This expression is apt, since "blowing" increases acceleration and cars so equipped are gone with the wind.

The eve of the race finds all contestants in the Drivers' Meeting, where they are scolded, warned, and encouraged by the race chairman. (This harassed individual admits he has wires from all over the country stating, "BROKEN DOWN IN EAST OVERSHOE PLEASE DON'T SCRATCH ME.") Contestants are briefed in flag signals: red, stop immediately; yellow, slow down and hold places; green, track clear; black, stop at your pit; crossed flags, you have completed half the race; and checkered, you are finishing.

Next morning competing cars are assigned pits—roadside positions near the finish line—where tables are placed to hold tools, fuel, and spares. Here only a few minutes before the start you may hear someone ask, "What say we take the wheels off?" With some sports cars, replacing four wheels is about as much trouble as putting a new flint in your lighter.

Races generally begin from a standing start, the cars two abreast in positions drawn by lot. In the final go at Bridgehampton the racers were led once around the course and made a flying start. Sports cars are classified according to piston displacement in cubic centimeters. The range runs from 1,000 cc. for an "unblown" M.G. to 5,200 cc. for an Allard powered by a Cadillac engine, a power plant that lends itself admirably to road racing.

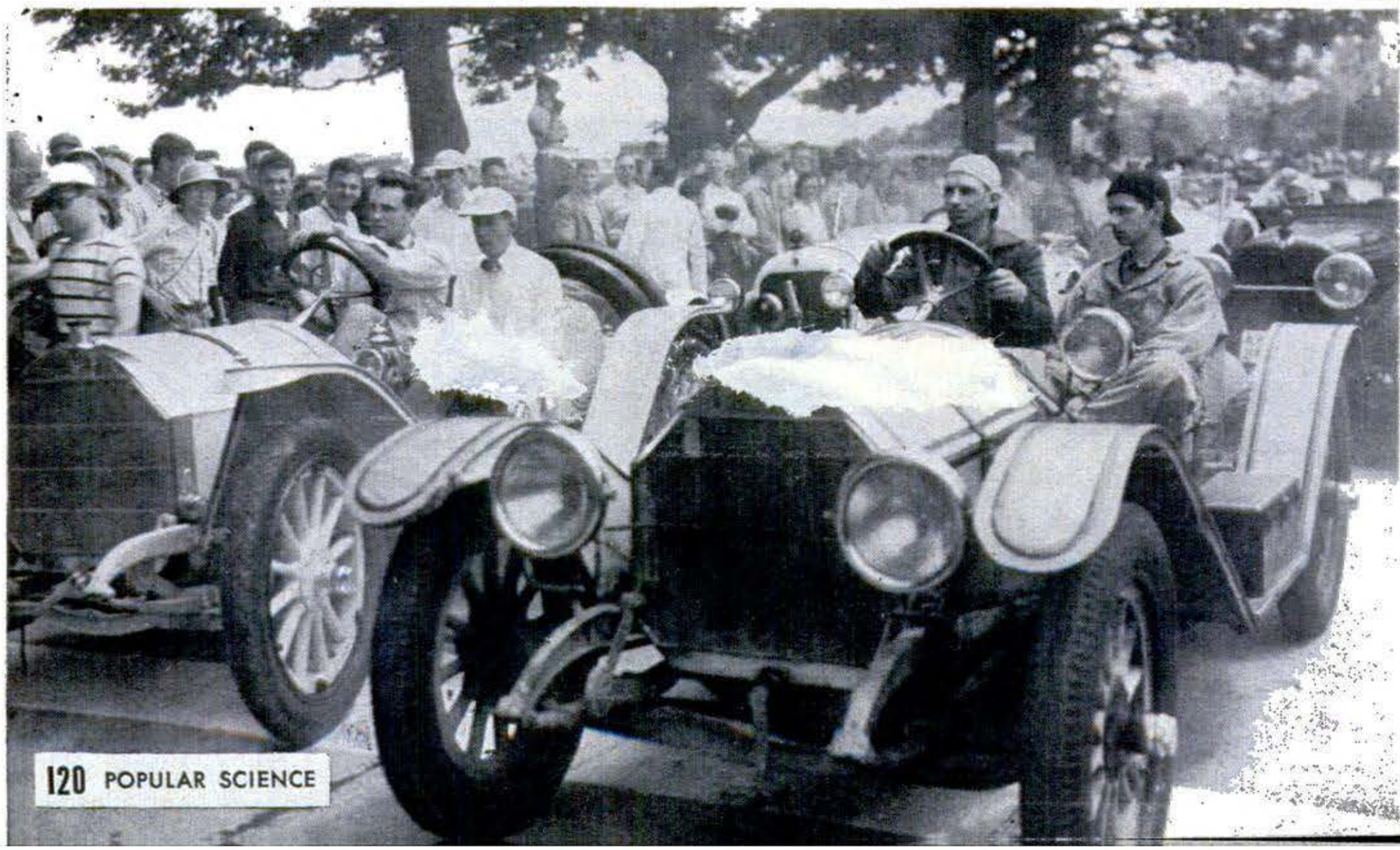
Speeds are impressive when it is remembered that the races are run at Bridgehampton over narrow, mostly macadam roads, with two 90° turns and one greater than that, and no real straightaway amounting to as much as a mile. Tommy Cole, a transplanted Britisher, drove an English Allard with a twin-carburetor Cadillac engine 80 miles at a fraction under 80 miles an hour. His best lap was at 83 miles an hour—and this on a circuit where you wouldn't want to push the family sedan over 35.

Sports cars—not to be confused with home-built hot rods, which are frequently unsafe for high-speed "cornering"—must meet highway specifications. They must have lights, horn, fenders, a windshield and accommodations for a spare tire. They differ from racing cars, such as compete at Indianapolis, in that they are built for rugged road conditions, hill-climbing, and negotiating sharp turns.

Sports-car activity is not confined to racing and casual touring. Under the auspices of various clubs, hill climbs, accelerations tests, and rallies are regularly held. The next road race will be at Watkins Glen, N. Y., on September 23, when the American Grand Prix will be contested over a six-mile course that has been described as "up and down, around and about, over bridges and under, with two grade crossings thrown in."

Will you join us? END

Antique sports cars were scheduled to do a four-lap exhibition run, for which they are shown in the starting lineup, but it developed into a real race by the time they hit the second lap.



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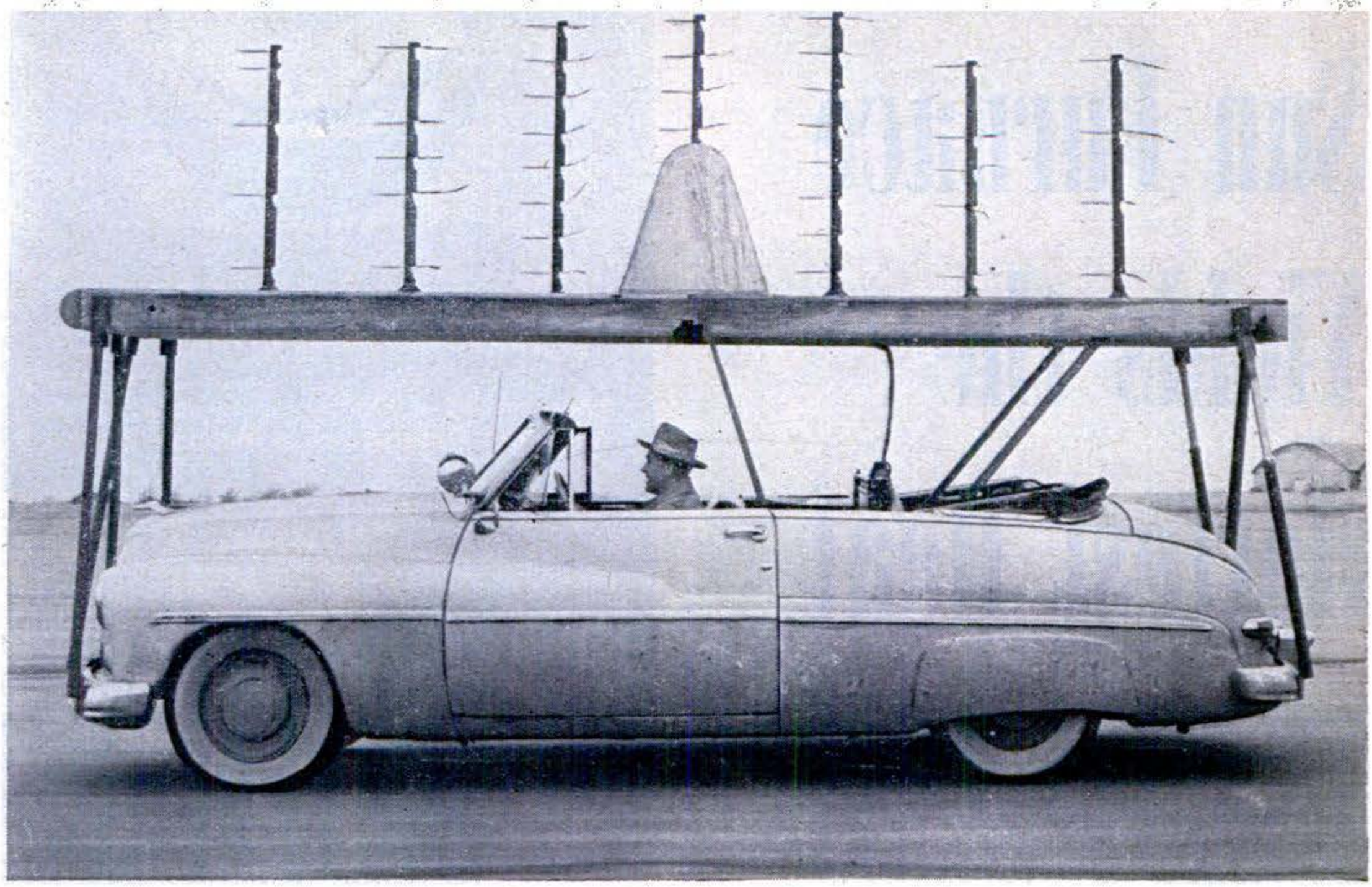
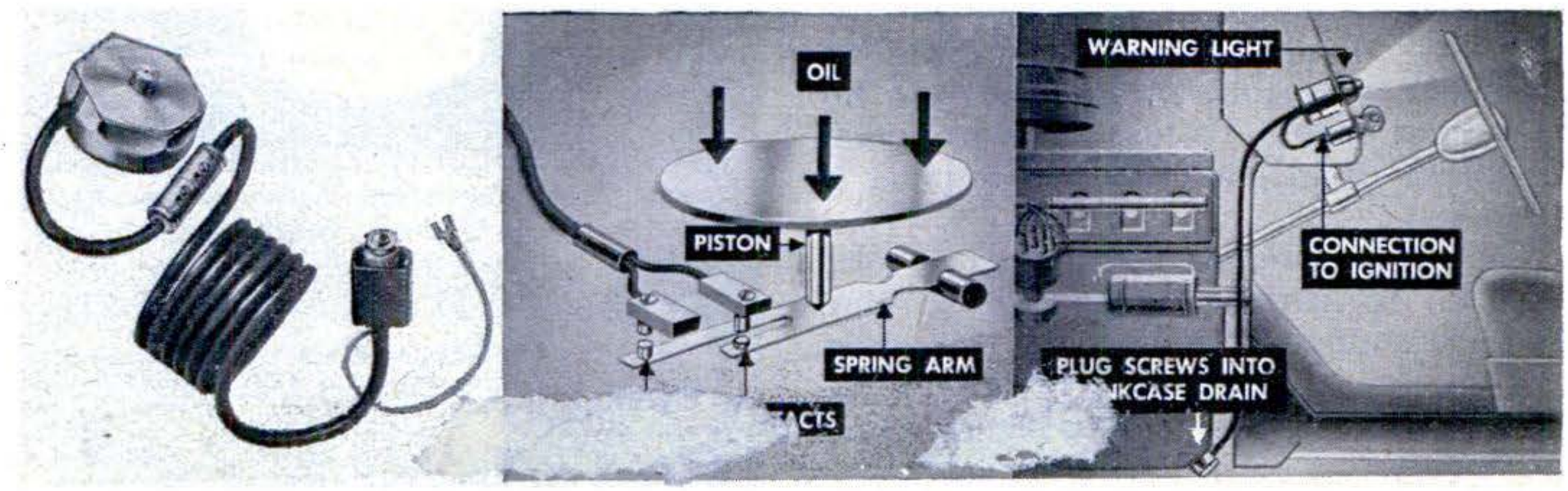


Car Solves Air Crash Mystery

THE strange-looking contraption on top of this car is helping aircraft engineers solve the mystery of mountaintop plane crashes. Air blowing over a mountain ridge expands as it flows down the lee side, causing a sharp drop in air pressure. This gives a plane's altimeter a higher reading, causing the pilot to think he has a lot more altitude than he actually has.

To get at the problem, the Beech Aircraft Corp., of Wichita, Kans., places baby mountains on top of the car-mounted platform and then makes runs at 60 m.p.h. to find out just how much the pressure drops. The vertical pipes hold tubes that record the air pressure at various points on both sides of the model. Results show that the two-foot "mountain peak" can cause an altimeter error of 125 feet—enough to allow an unsuspecting pilot to crash in bad weather.



Warning Light Spots Oil Drop

FORGETFUL motorists won't run out of oil with this new warning device. The Oil-Spy lights up when your oil level drops. A dash light is wired to a plug that replaces the drain plug in the crankcase (far right). The oil, pushing down a piston inside the plug, holds a spring arm away from two electrical contacts (center). When oil level drops one quart, the decrease in weight lets the arm push up against one contact, lighting an amber bulb. When it drops two quarts, the second contact lights a red bulb.

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Sun Furnace Yields the Hottest Heat

Experimenters with a giant "burning glass" seek new high-temperature data to benefit science and industry.

By Alden P. Armagnac

THE little French suburb of Meudon, a few minutes' drive from Paris, boasts what well may be the hottest place on earth.

Scientists have set up in the open there, at the Observatory of Meudon, a furnace that looks like a searchlight. It yields an estimated maximum temperature of about 9,000° F., which approaches that of the surface of the sun. Hotter by far than the hottest man-made flame, it melts or turns to vapor anything you can name.

Inspecting the Meudon furnace for the first time, an observer looks in vain for massive electric cables feeding it power. No raging fires heat it. To turn it on, its operators simply twirl handwheels that point it at the sun.

For this remarkable apparatus, a "solar furnace," is actually a gigantic burning glass. Scientifically engineered, it works none the less on exactly the principle of the toy-sized hand lenses that char wood and burn paper.

Seeking new data to benefit science and industry, a pioneering team of three researchers is exploring uncharted realms of high temperature with its aid. The group consists of the research director of the National Center of Scientific Research, Felix Trombe; and his two associates, Marc Foex

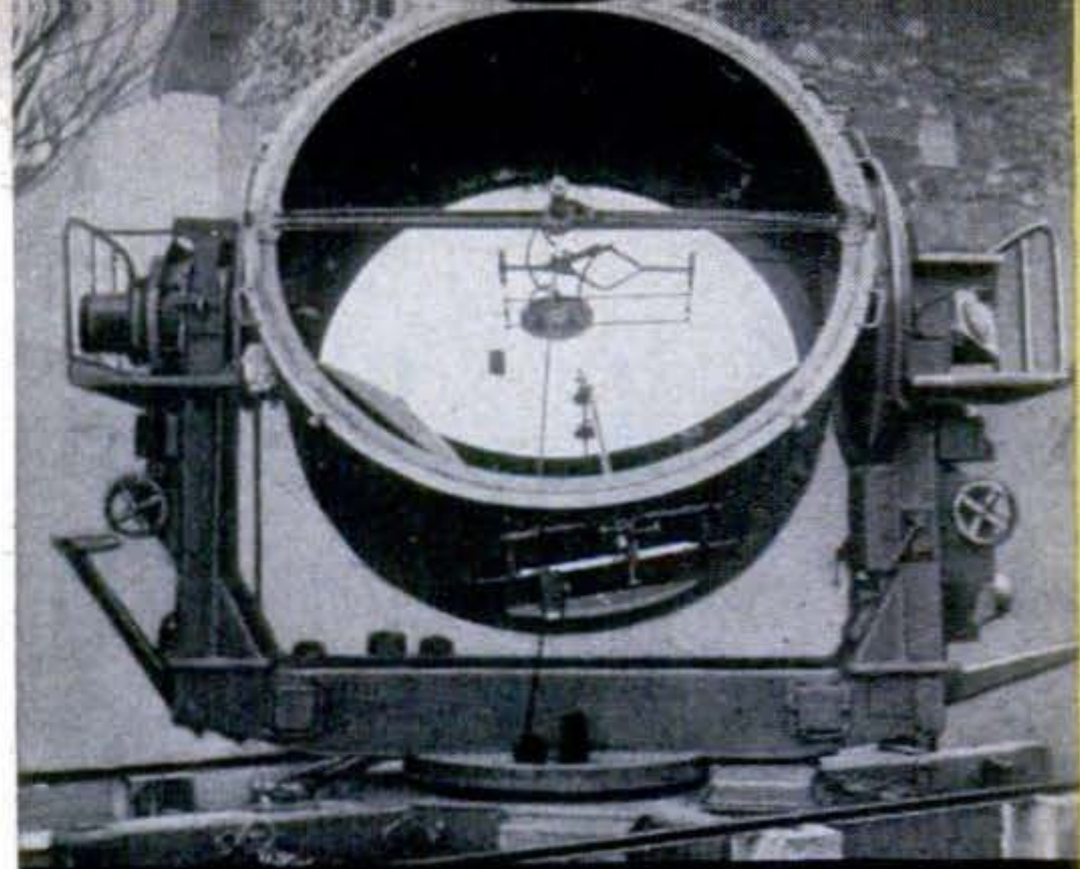
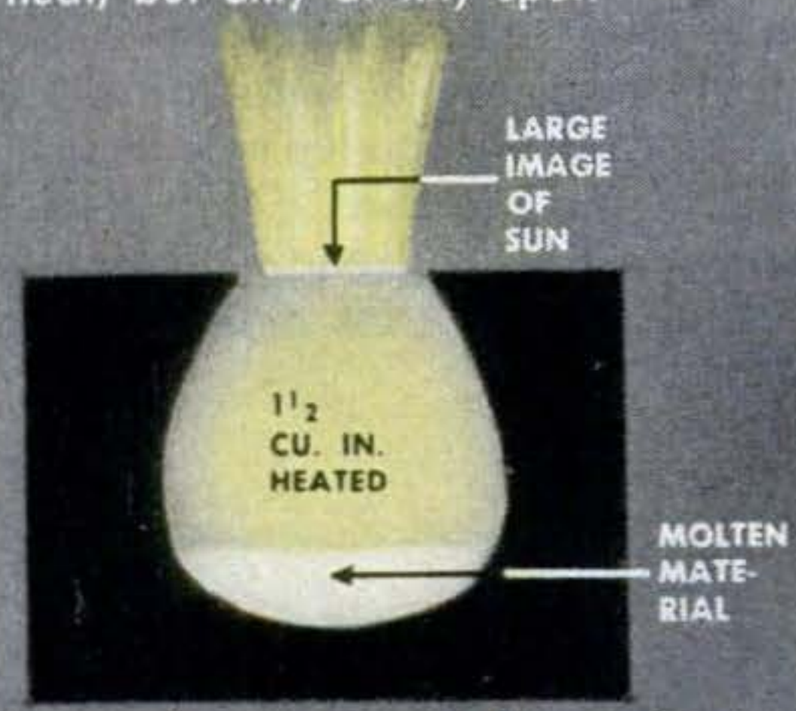


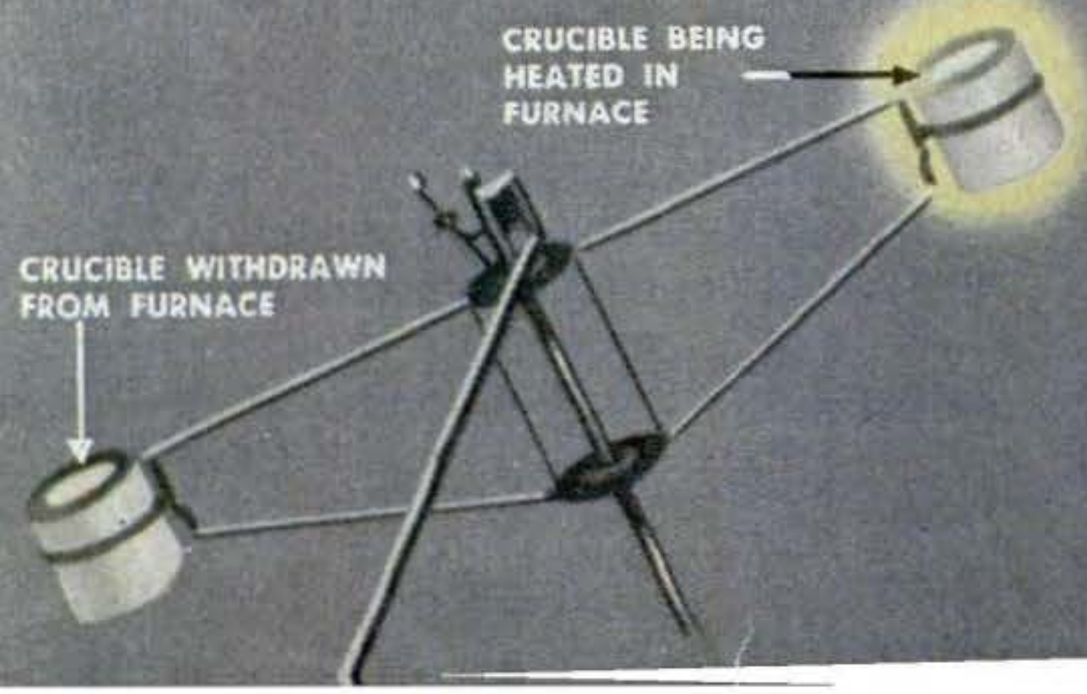
Photo shows 9,000° solar furnace set up for use at Observatory of Meudon, France.

Familiar principle of burning glass is applied by sun furnace. Hand lens will give great heat, but only at tiny spot.



Sun furnace heats this sizable space by producing big "hot spot," and focusing it on cavity in material to be treated.

Remote-control holder substitutes one crucible for another to permit uninterrupted series of high-temperature tests.



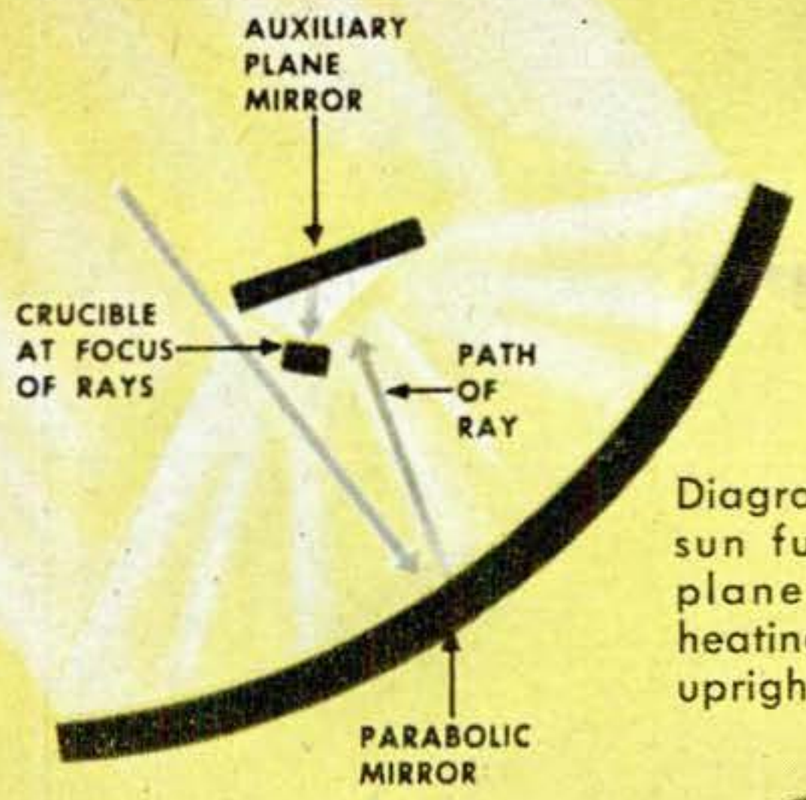


Diagram shows optics of sun furnace. Auxiliary plane mirror permits heating loose material in upright crucible.

Water cooling keeps heat from melting plane mirror, made of polished aluminum and mounted within five inches of rays' focus.

This is actual size of 5/16-inch-diameter image of sun, "hot spot" of the French solar furnace.

78-INCH PARABOLIC MIRROR CONCENTRATES SUN'S RAYS

AUXILIARY 18-INCH, WATER-COOLED, PLANE MIRROR

CRUCIBLES

CONTROLS MANIPULATE MATERIAL IN FURNACE

STANDARD SEARCHLIGHT CONTROLS TRAIN FURNACE ON SUN

Artist's drawings show design, above, and details of solar furnace.

and Mlle. Charlotte Henry La Blanchetais.

Their furnace concentrates the sun's rays with an ex-German antiaircraft searchlight mirror of 6½-foot diameter, fashioned precisely to parabolic shape by the famed opticians of Jena. Its searchlight housing trains it on the sun. Aim is correct when a tiny solar image formed by a sighting telescope is centered on a target screen.

The big mirror has a focal length of 50 inches, and it acts like a burning glass on a block of material mounted just that far in front of it. A modified arrangement heats loose material more conveniently. A flat 18-inch auxiliary mirror of highly polished aluminum intercepts the converging rays, just before they come to a focus, and turns them downward upon material in an upright crucible. The area most intensely heated is confined to a fraction of a square inch, and a crucible of heat-resisting quartz withstands the surrounding temperature.

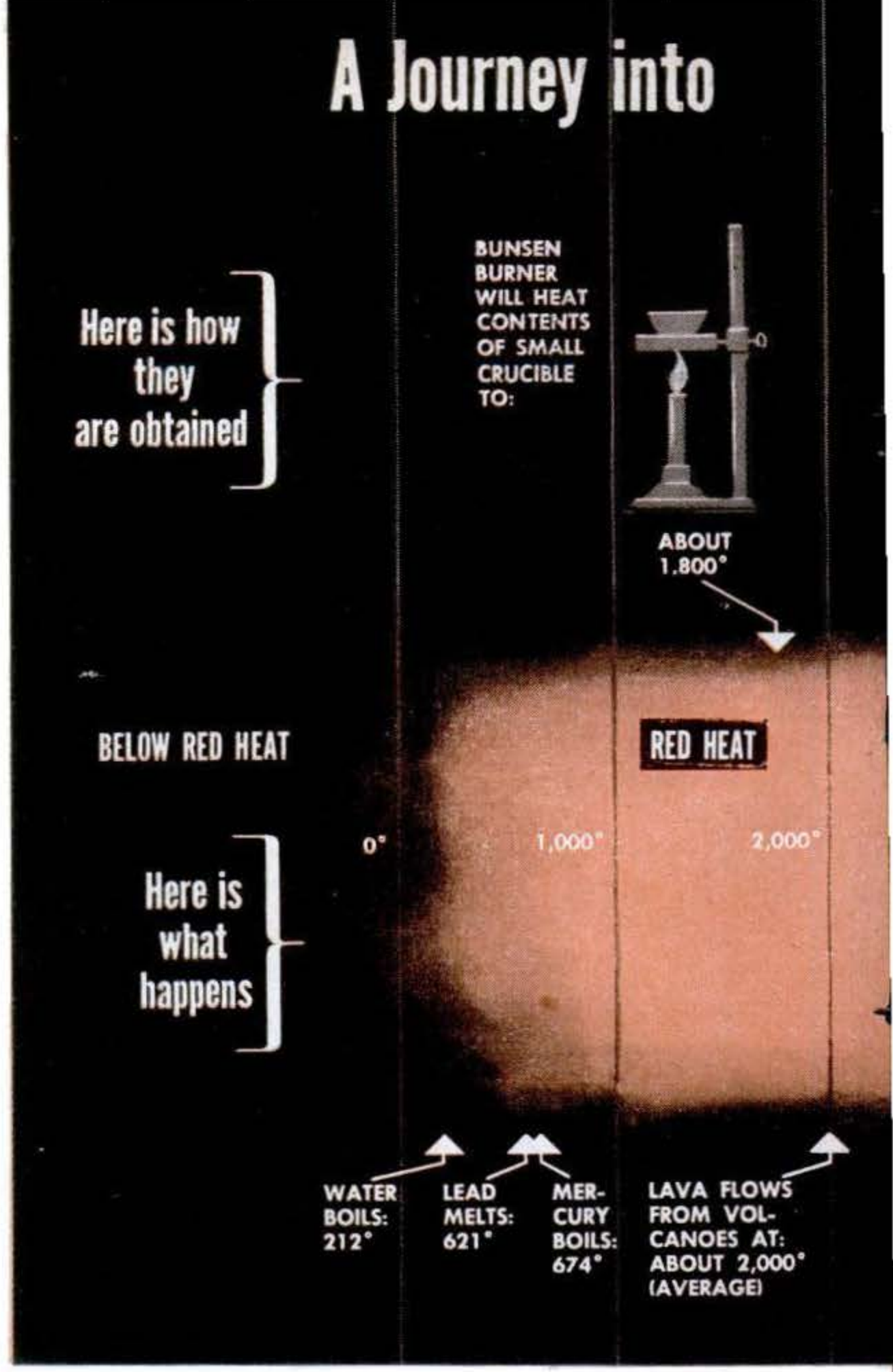
Superhot source of the furnace's heat is a 5/16-inch-diameter image of the sun formed at the focus. In theory, such an image might match the 10,700° F. surface temperature of the sun itself. Actually, the air and each mirror absorb some solar rays, and the small mirror, when used, slightly shadows the big one. Even so, the sun furnace yields a calculated maximum temperature of 9,080° F. with one mirror and 8,900° F. with two. Both arrangements have been used in experiments.

When the furnace's "hot spot" strikes a substance, extraordinary things happen.

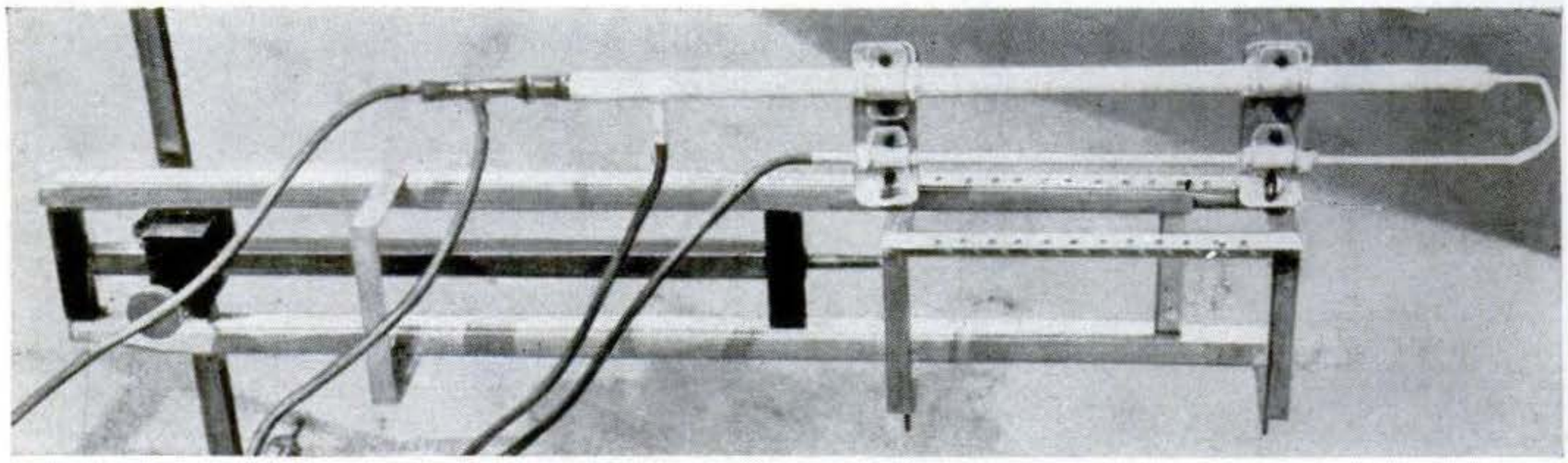
In 10 seconds, a one-ounce chunk of iron liquefies, and partly vaporizes.

Only 30 seconds' time is needed to melt alumina, whose fusion point of more than 3,700° F. exceeds that of firebrick.

Volcanic lava is ice water compared to molten thoria. It takes 5,400° F. to fuse this opaque white oxide of thorium, one of the most refractory substances known. Melting it with ease, the sun-furnace experimenters obtain solid, fused thoria in the novel form of a transparent pinkish-colored "glass."



Temperature of sun furnace surpasses that of hottest flame, produced by newly developed



Sun furnace captures air's nitrogen with quartz tube above. Right-hand end of thick section is heated. When experimenters feed a gentle stream of air through tube, they obtain nitric oxide, raw material for fertilizer. Novel process might rival present commercial ones. Connections to tube, left to right, are cooling-water inlet and outlet, air outlet and inlet.

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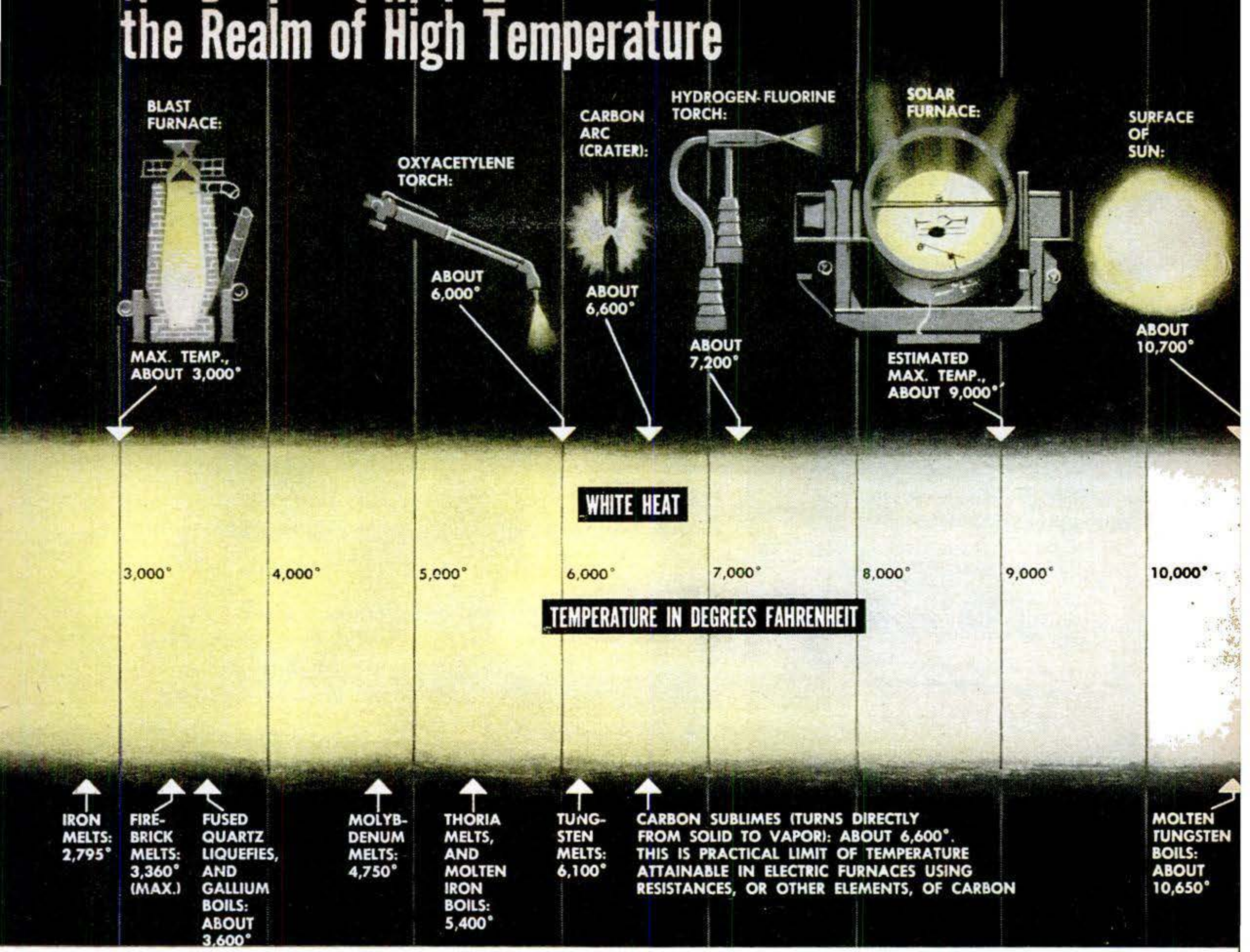
the Realm of High Temperature



hydrogen-fluorine torch. Data below scale of pictorial chart show how heated materials behave. All become red-hot and white-hot at temperatures indicated, regardless of composition.

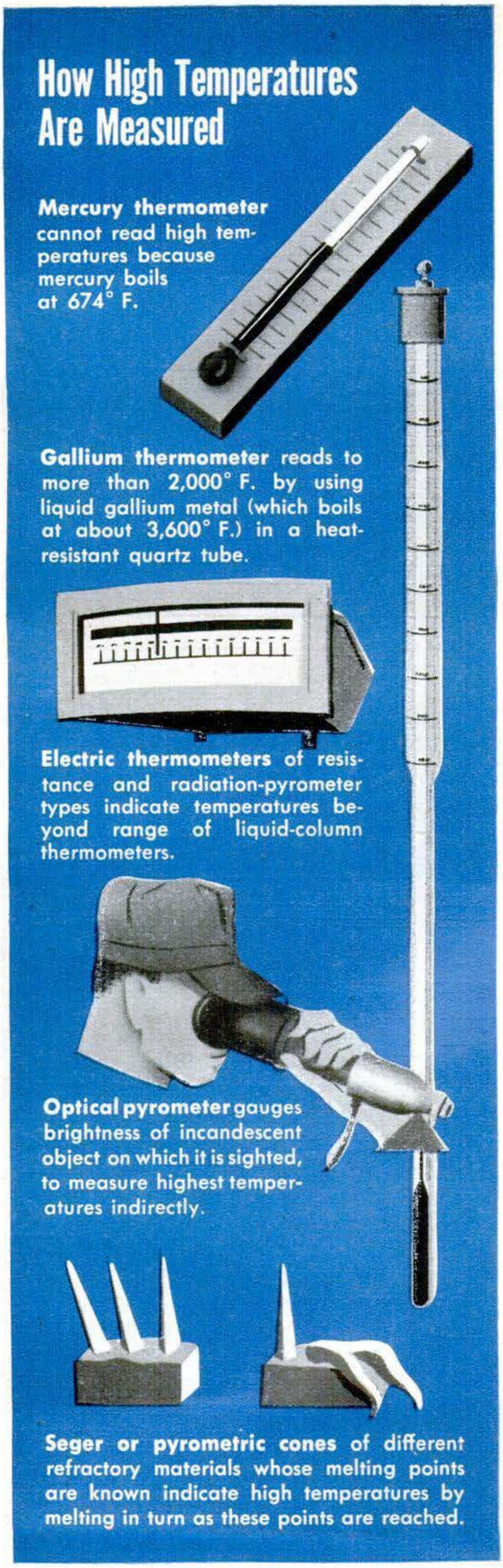
Heated even hotter, to 6,600° F., graphite turns directly to vapor in the solar furnace.

An era of jet engines, rockets, and atomic power highlights the usefulness of the new sun furnace for testing refractory materials. Ceramic glazes of alumina and magnesia, bonded to metal, are among the most promising of materials being perfected to enable turbine blades and combustion chambers to stand higher and higher temperatures. Beryllia crucibles were used to melt uranium for the atom bomb. More recently, atomic workers are using crucibles of a remarkable new refractory, cerium sulphide, which has a metallic gold color and can withstand 4,000° F. in a vacuum melting furnace. Now sun-furnace experiments may lead to other improved materials.

Crucibles holding up to 1¾ ounces of material for test in the sun furnace are placed at its focus in a revolving holder. To produce larger fused specimens, the experimenters continuously feed powdered material from a hopper to a crucible at the "hot spot" through a quartz tube in which a rotating nickel-chrome fitting acts as a miniature screw conveyer. Meanwhile the crucible is slowly lowered, and a solid piece of fused material is built up—much as synthetic rubies and sapphires are "grown" by sifting powdered material through a flame that fuses it.

Ingots up to nearly three inches in length of fused zirconia, beryllia, and alumina, substances whose melting points range up to more than 4,850° F., have been produced in the sun furnace. Its operators have adapted it to turn these materials into tubing, crucibles, and other useful laboratory ware, by rotating the heat-treating crucible like a potter's wheel.

High-temperature chemical reactions can be carried out in the sun furnace. One of these suggests a novel way to capture the



air's nitrogen for manufacturing fertilizer.

The experimenters focus the sun's rays on a quartz tube, containing loose granules of thoria to hold a high heat. A gentle stream of air passes through the tube, absorbing enough of the heat to keep the quartz and thoria from melting. Just as in big electric-arc furnaces, the air's nitrogen and oxygen combine to form nitric oxide—raw material for nitric acid and, in turn, nitrate fertilizer. A water-cooled section of the tube abruptly chills the product, to keep it from decomposing in slow cooling, and it is recovered by leading the air containing it through a chemical solution. The yield in percentage compares not at all badly with that of the fabulously power-consuming arc process—and the solar energy is there for the taking!

Record Highs in Temperature

Far greater temperatures than the sun furnace's can be obtained momentarily. Though estimates vary widely, all credit the atom bomb's explosion with a heat of millions of degrees—undoubtedly the highest temperature attained by man. Previously the record was about 36,000° F., obtained when Mt. Wilson Observatory experimenters exploded small wires with electric currents of as much as 60,000 volts and 45,000 amperes from a bank of condensers.

Temperatures sustained long enough to treat materials and study their behavior have been much more modest. A former record of 6,600° F. for furnaces was set by deliberately heating an electric induction furnace containing a graphite crucible until it was wrecked—to see how hot it could get. Although higher temperatures have been measured at some points in electric arcs, this is the limiting figure at which graphite elements of furnaces vaporize.

Hottest of flames is that of the hydrogen-fluorine torch, a recent and novel U. S. invention. It attains 7,200° F. Copper, which conducts heat away so fast that an ordinary torch makes little impression on it, can be welded or cut with the new one. Uniquely, it produces *combustion without oxygen.* Concentric copper tubes supply fluorine gas through a central orifice, and hydrogen gas through an annular one, at the nozzle. The hydrogen chemically combines with the fluorine, just as it does with oxygen, producing heat and flame.

The sun furnace, which opens the way to still higher temperatures, is no new implement. Giant burning glasses were popular

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World's Biggest Color Photo

VISITORS to New York City's Grand Central Terminal are now greeted by this giant color transparency, the largest of its kind ever made. Sixty feet long and 18 feet high, the illuminated transparency is part of a new photographic exhibit and information center recently set up on the station's east balcony by the Eastman Kodak Co.

Made at the Kodak plant at Rochester, N. Y., the giant Colorama, as it is called, was enlarged approximately 44 diameters from the original negatives.

It was made by slicing 5- by 9½-inch negatives into small strips ½ inch wide and 5 inches long, and then enlarging these, one at a time, on special positive color film. The enlarged strips, each 19½ inches wide and 18 feet long, were then carefully trimmed, matched, and spliced together to form the completed picture. Finally, this was wound on a 20-foot-long spool and shipped by rail to New York City. At Grand Central Terminal, special tracks were laid to permit a small flatcar carrying the spool to roll right out onto the balcony.

Suspended in a giant steel frame, the transparency is illuminated from behind by more than a mile of tubular cold-cathode lamps spaced 2½ inches apart, the largest such lighting installation ever built Across the back is a plastic sheet frosted like photographic ground glass to diffuse the light and insure even illumination. Across the face is a similar sheet that is nearly transparent except for a slight diffusive effect that prevents reflections and glare from lights.

The display will remain in Grand Central indefinitely, with the picture changed every few weeks. At times the entire expanse will be given over to a single scene. END

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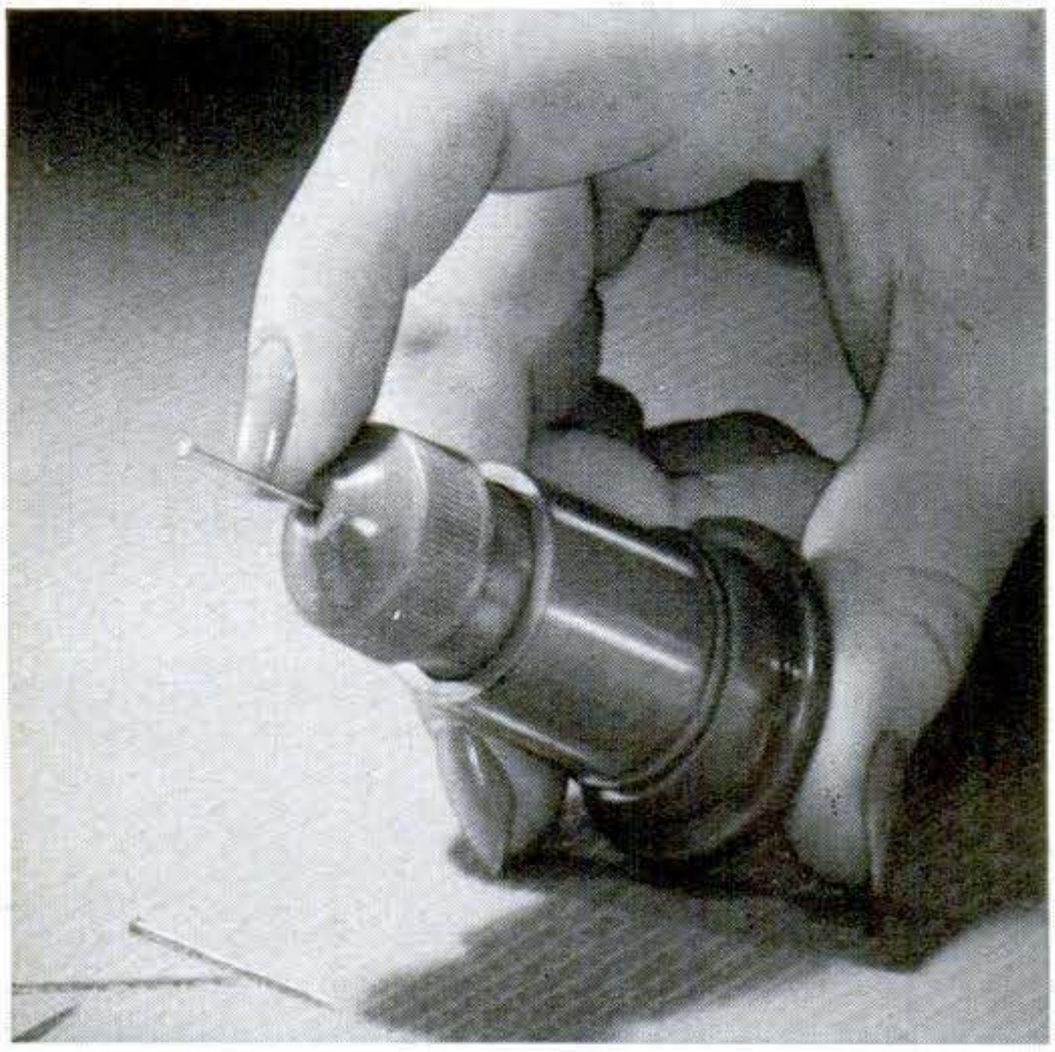
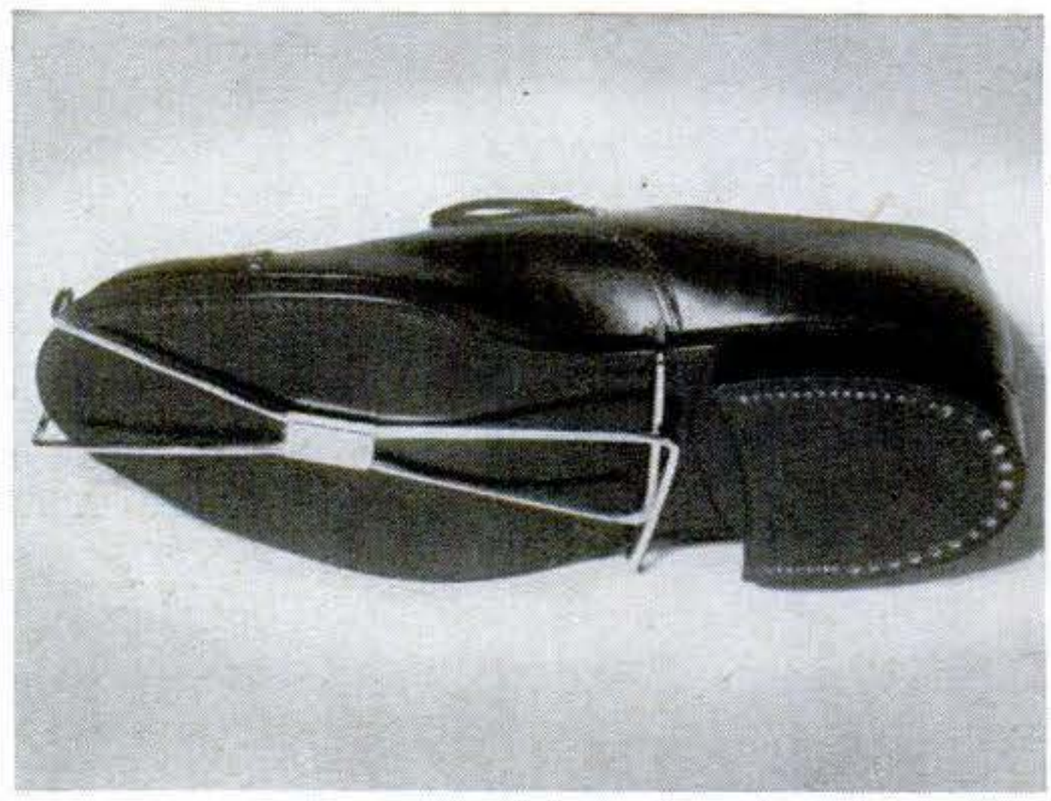
Aids to Modern Living



CONTAINER DISPENSES PINS. This plastic gadget stores straight pins and also hides them from small children. A press-down action, as shown above, pops out a single pin, head first, through an opening in the removable cap. Novo-Plas Manufacturing Co., Inc., of New York City, prices the dispenser at about 30 cents.

CABINET IS REFRIGERATOR. The grained wood exterior of this combination refrigerator and cupboard, shown in inset above, makes it suitable for use in a living room or office. Measuring 33 by 36 by 20 inches, the snack bar has a stainproof Formica top, and stores beverages, glasses, food, and 56 ice cubes. A ⅛-hp. compressor operates on AC. L. B. Herbst Corp., of Chicago, distributes the bar.

TWO HEADS ARE BETTER THAN ONE. This sprinkling can has interchangeable heads: one for regular spraying and a smaller one for applying weed killer or watering potted plants. The head not being used is screwed to a threaded base at the top of the can. Geuder, Paeschke & Frey Co., of Milwaukee, Wis., makes Tri-Way.



TREE CLAMPS TO OUTSIDE OF SHOE. To prevent your shoe from curling, just place the curved end of this new all-metal shoe tree over the toe, squeeze open its clamp, and place over the shoe's sole edges, as shown. Made by Fortner and Perrin, of Glendale, Calif., the trees fit any size shoe. Three pairs sell for $1.25.

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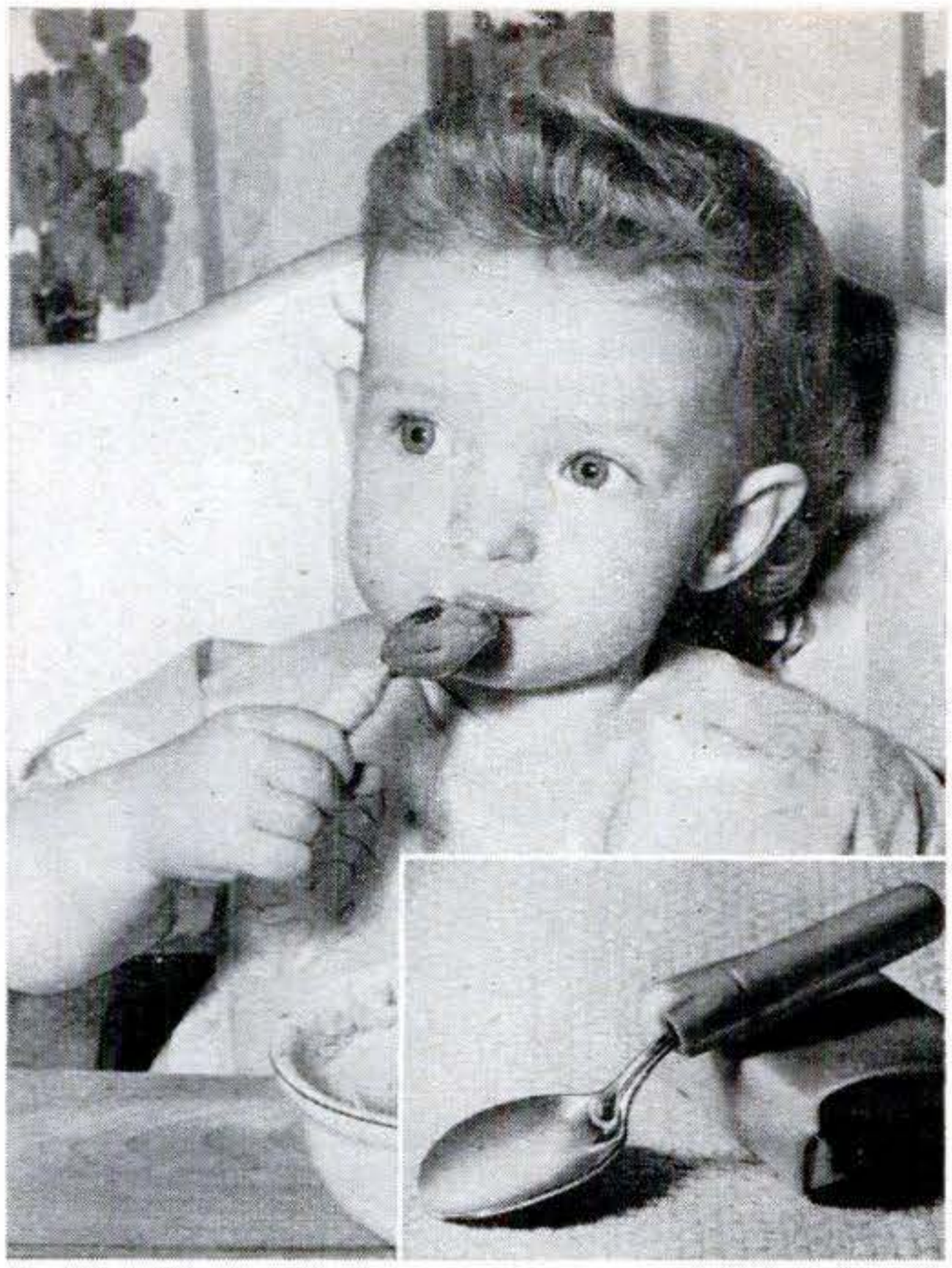
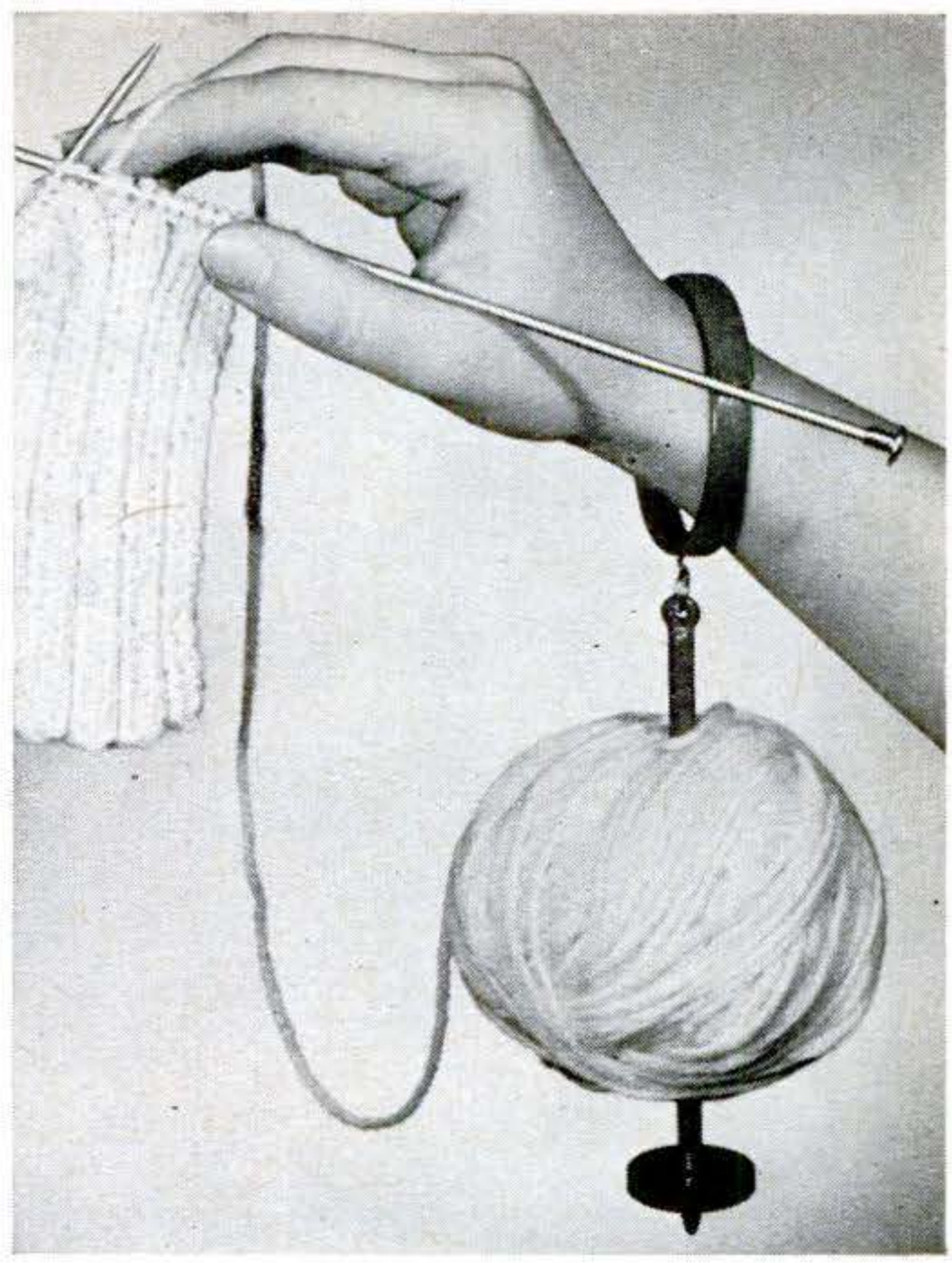
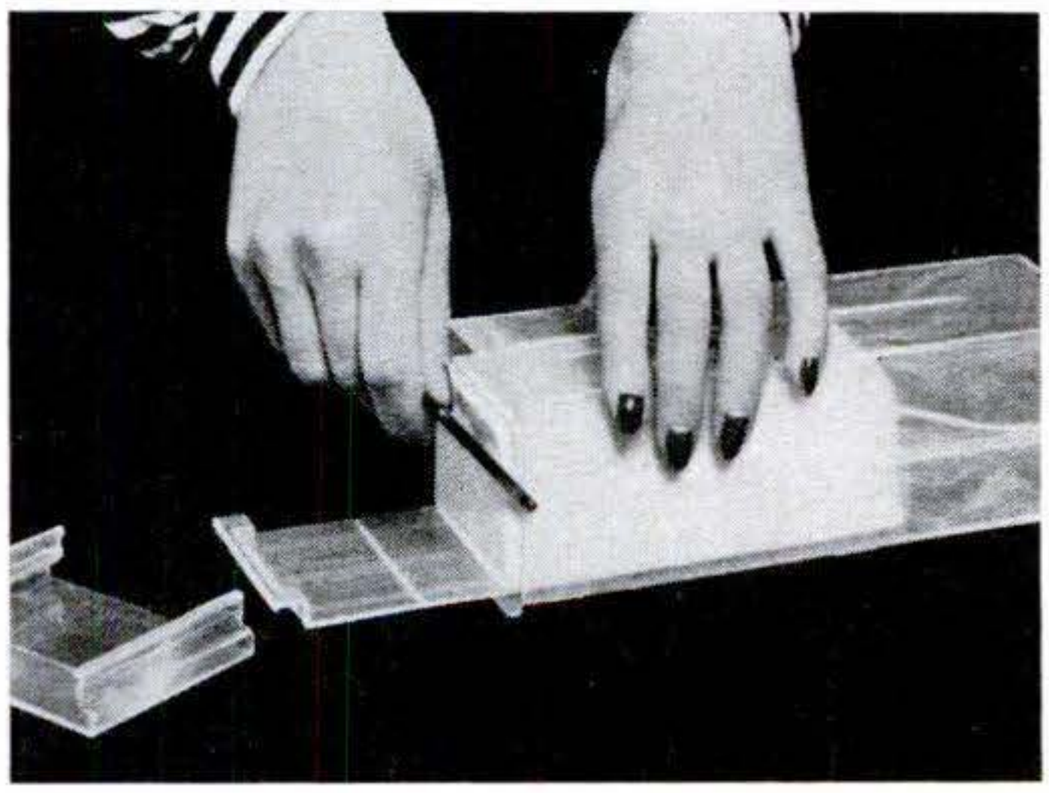


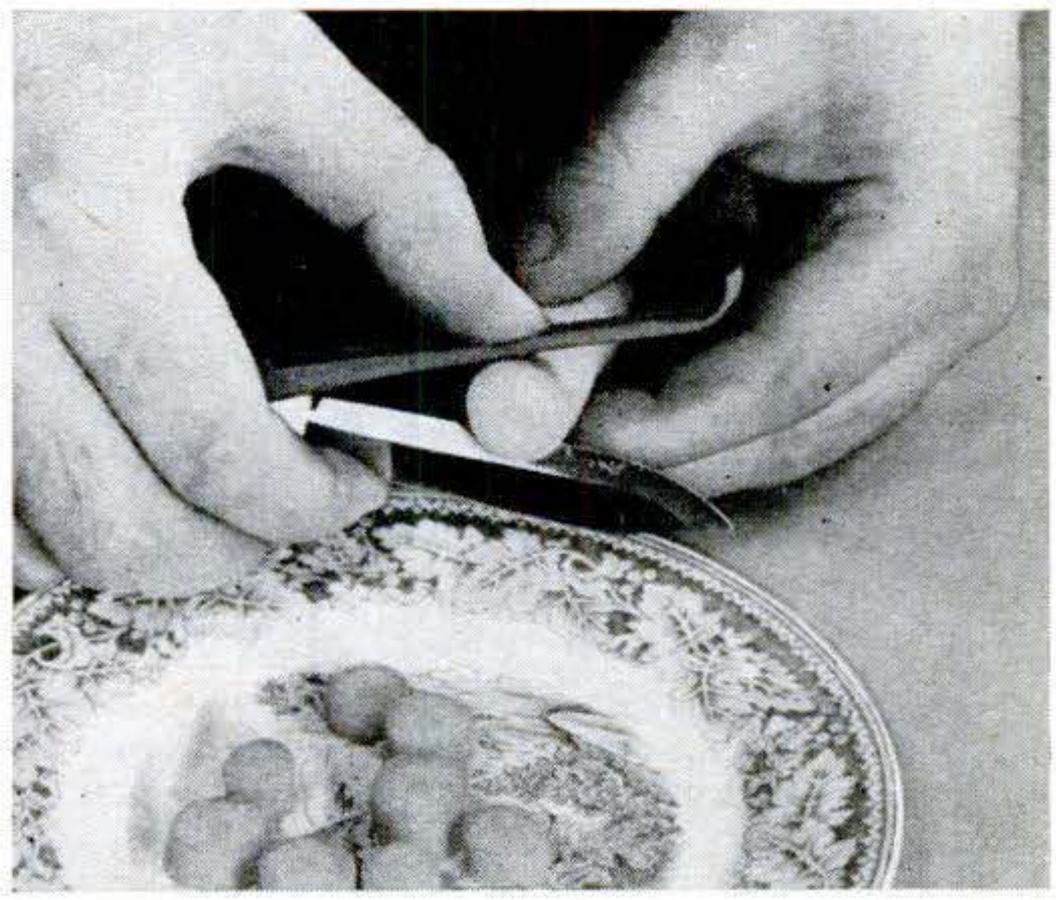
SWIVEL HOLDS SPOON LEVEL. The stainless-steel bowl of this training spoon has a swiveling device that keeps it level between plate and mouth. The slight pressure exerted in scooping up food, however, holds the bowl firmly in one position. And by adjusting a locking device on the detachable handle, the spoon becomes a conventional one (inset). It is available from Price Industries, of Akron, Ohio, for $1.25.



YARN STAYS AT HAND. Balls of knitting yarn or crocheting thread suspended from this Tenite plastic bracelet dangle but won't tangle—or roll under furniture. A removable button on the bottom of the shaft piercing the ball keeps it from falling off. The Knit Bit Holder is sold by the Gerard Co., of Winnetka, Ill., for $1.



CUTTING BOX KEEPS CHEESE FRESH. A two-pound cheese package stored in this container pulls out on a sliding tray for easy slicing. The cutter, when not in use, slips into a slot in the end cover. Made of polystyrene, Chee-Slicette can be washed in scalding water. The Kenneth E. Luger Co., of Minneapolis, sells it for $1.



KNIFE HAS THUMB PROTECTOR. A plastic guard on this knife lessens the hazard of cutting your thumb. To slice a vegetable, hold it between the protector and the knife blade, as above. To use the knife in the ordinary way, fold the protector back against the handle. It is priced at 50 cents by Miles Kimball Co., of Oshkosh, Wis.

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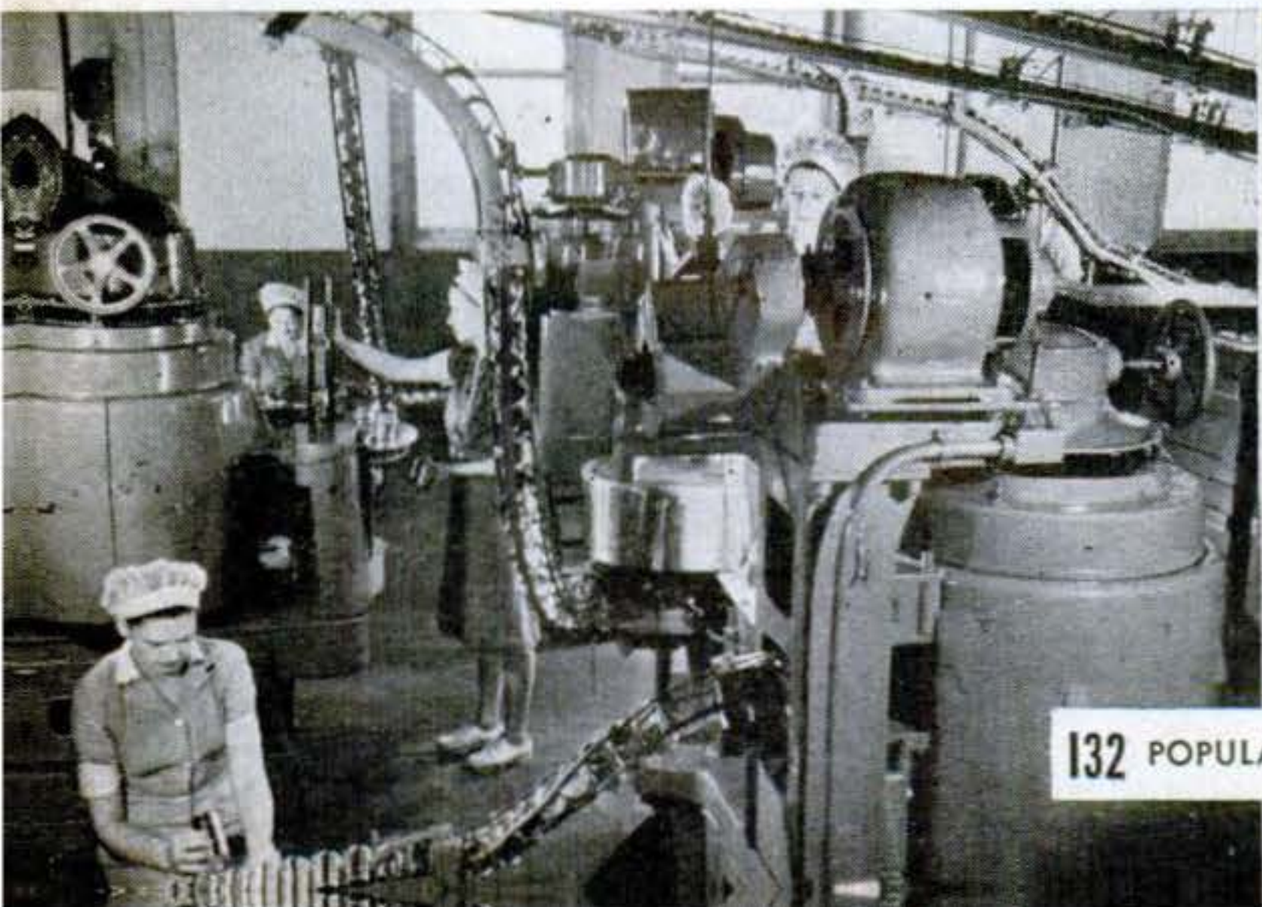
1 TIN CAN BEGINS at plating mill where steel strip is given thin coating of tin as it passes through electrolytic bath. Ninety-pound bar of pure "pig" tin above serves as anode, source of the tin.

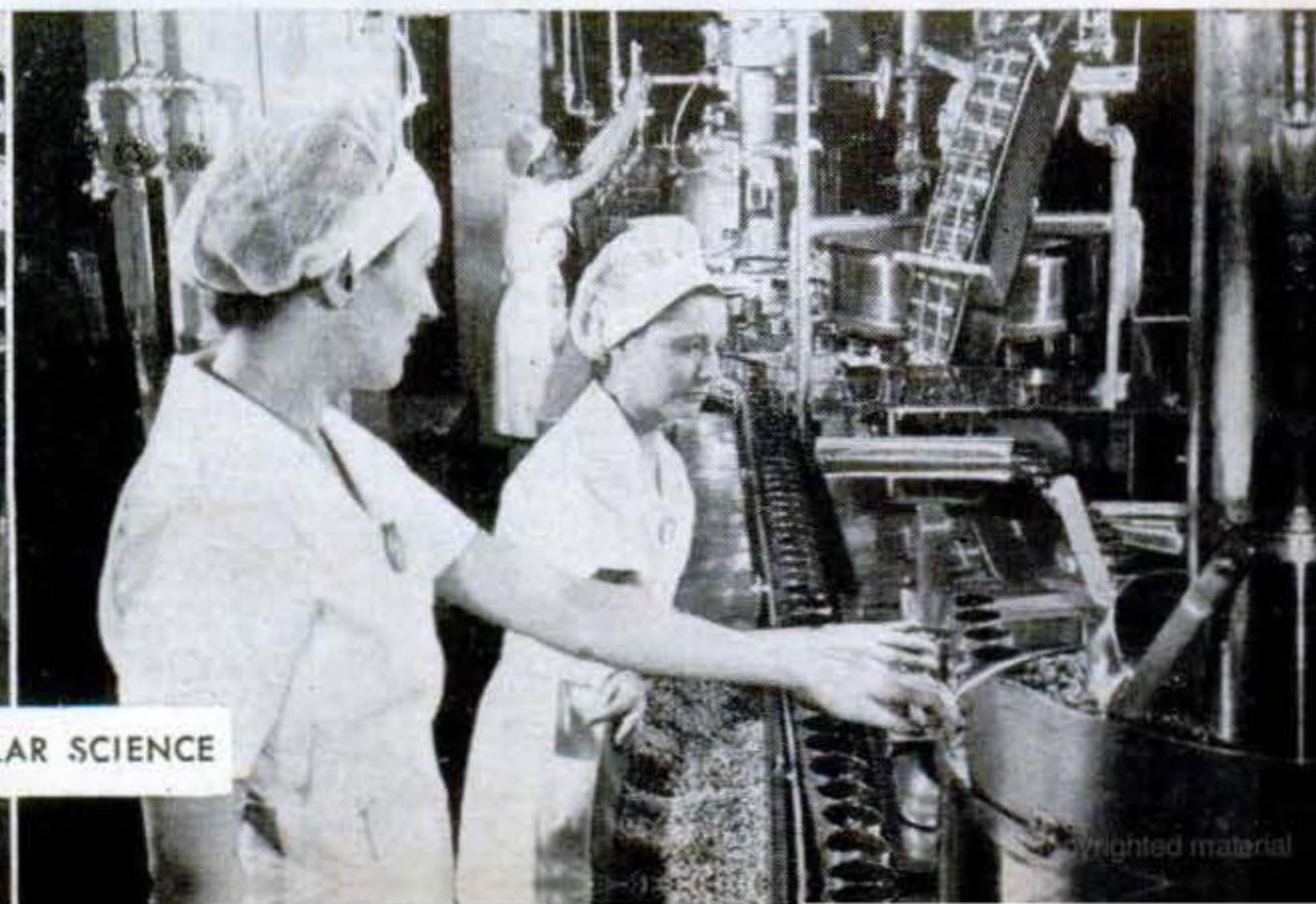
53 Million Tin Cans Every Day

BEHIND the cans you use—53 million every day—are scores of complicated machines and miles of clattering conveyers. The body steel is first plated with tin to keep it from rusting. Then it is punched, pounded, bent, and squeezed into the shape of a can. Finally it is cleaned, filled, capped, and labeled. Yet if all the machines were joined in a single assembly line, it would take only minutes to turn a bare sheet of steel into a finished can of your favorite soup. That's how fast they work —and that's why over 40,000 products, in the food industry alone, can be packed into about 20 billion cans every year.

5 ENDLESS STREAM of can bodies moves into capping press that seals on bottoms with liquid rubber for airtight bond. Plant is American Can Co.



6 AT FOOD PACKERS, lidless cans are sterilized, then filled by machines, like this one at Heinz plant, that dispense right amount into each can.



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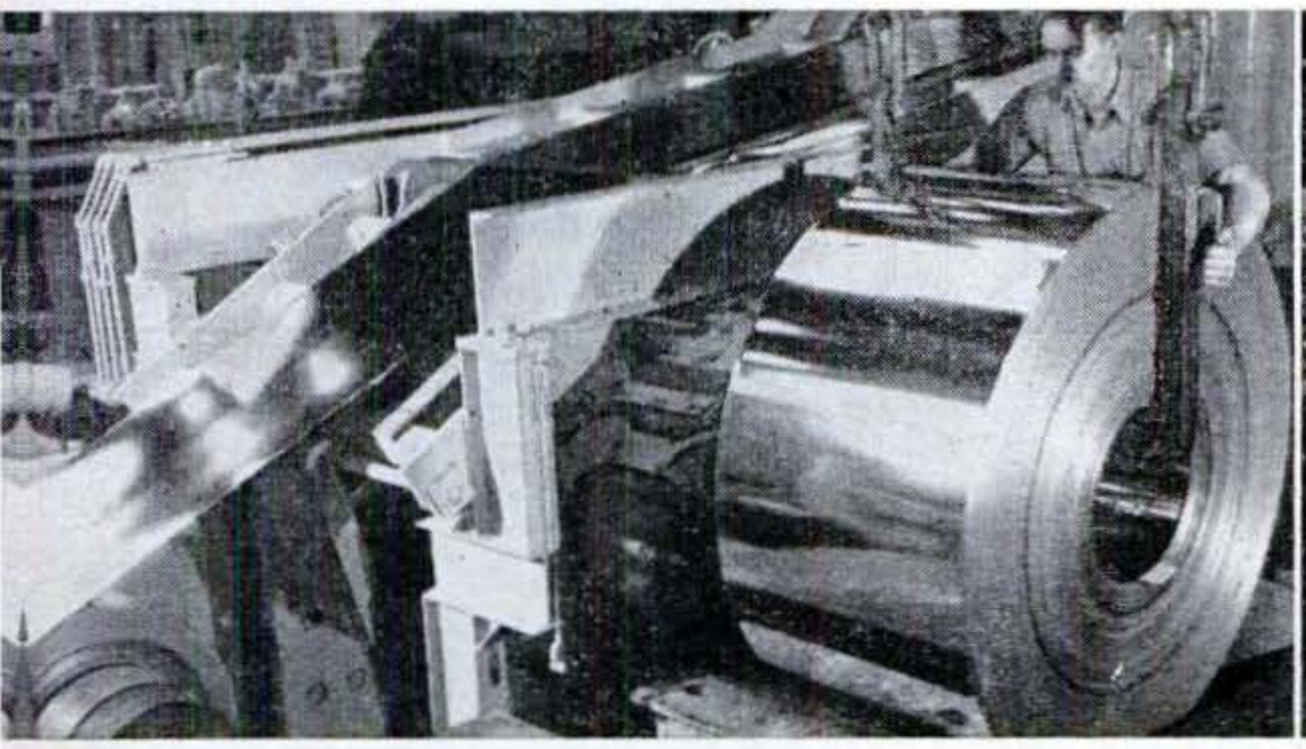
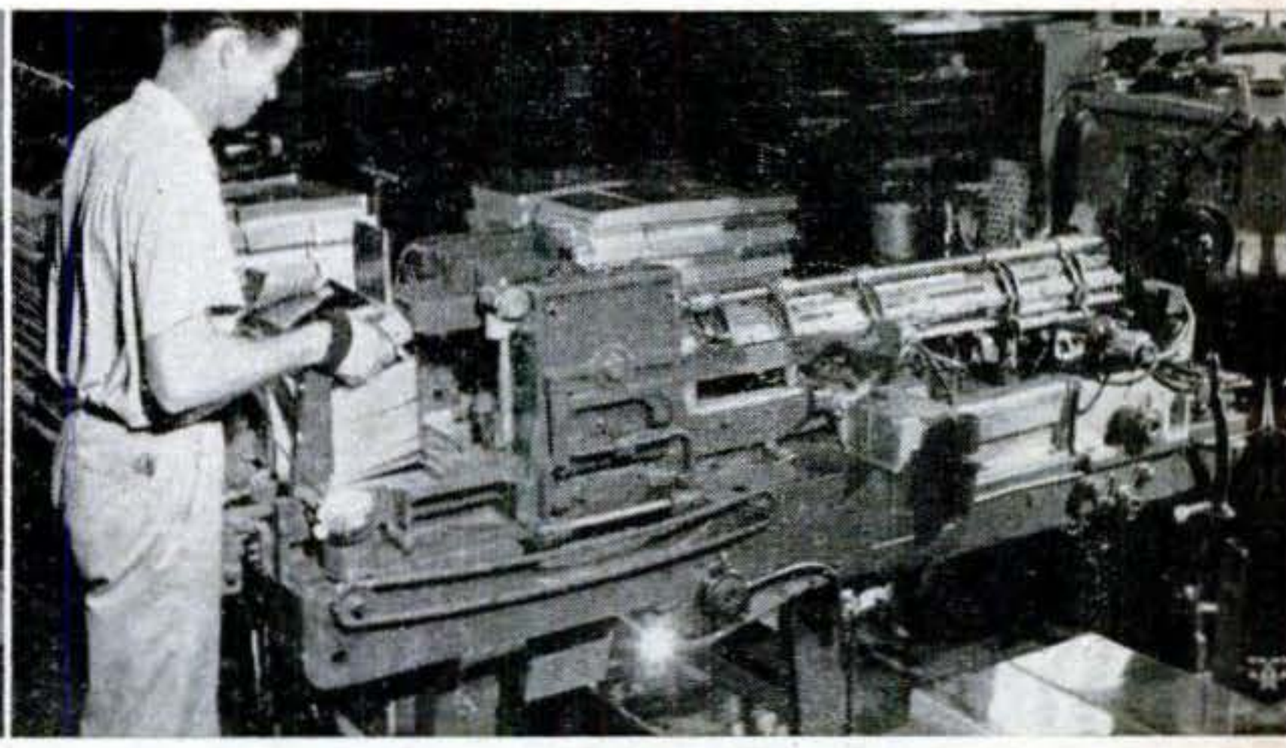
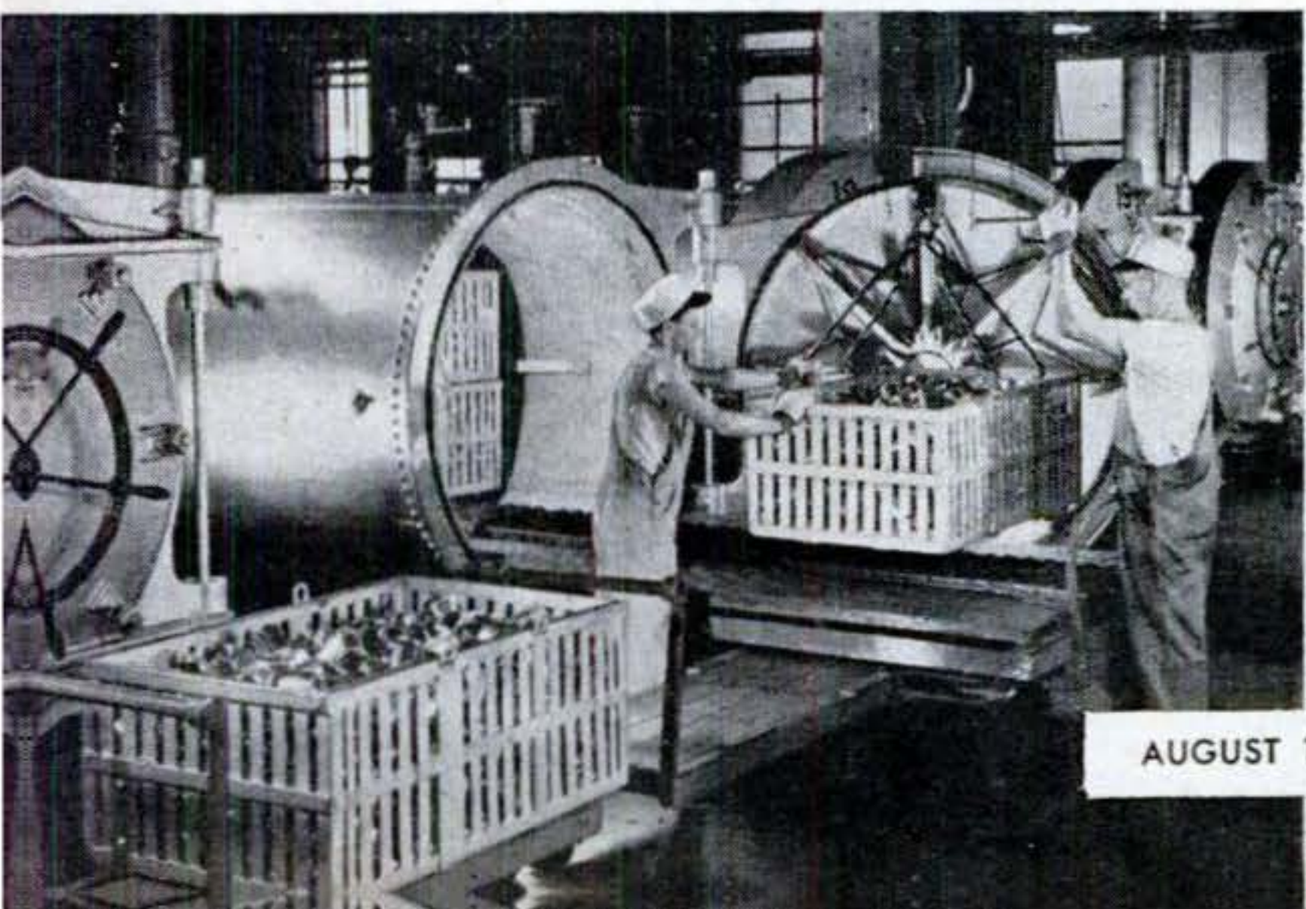
2 ELECTROPLATING METHOD, born of wartime need to save tin, vastly speeds process. This 400-foot installation at Weirton Steel Co. turns out tin-plated strip at rate of 2,240 feet a minute.



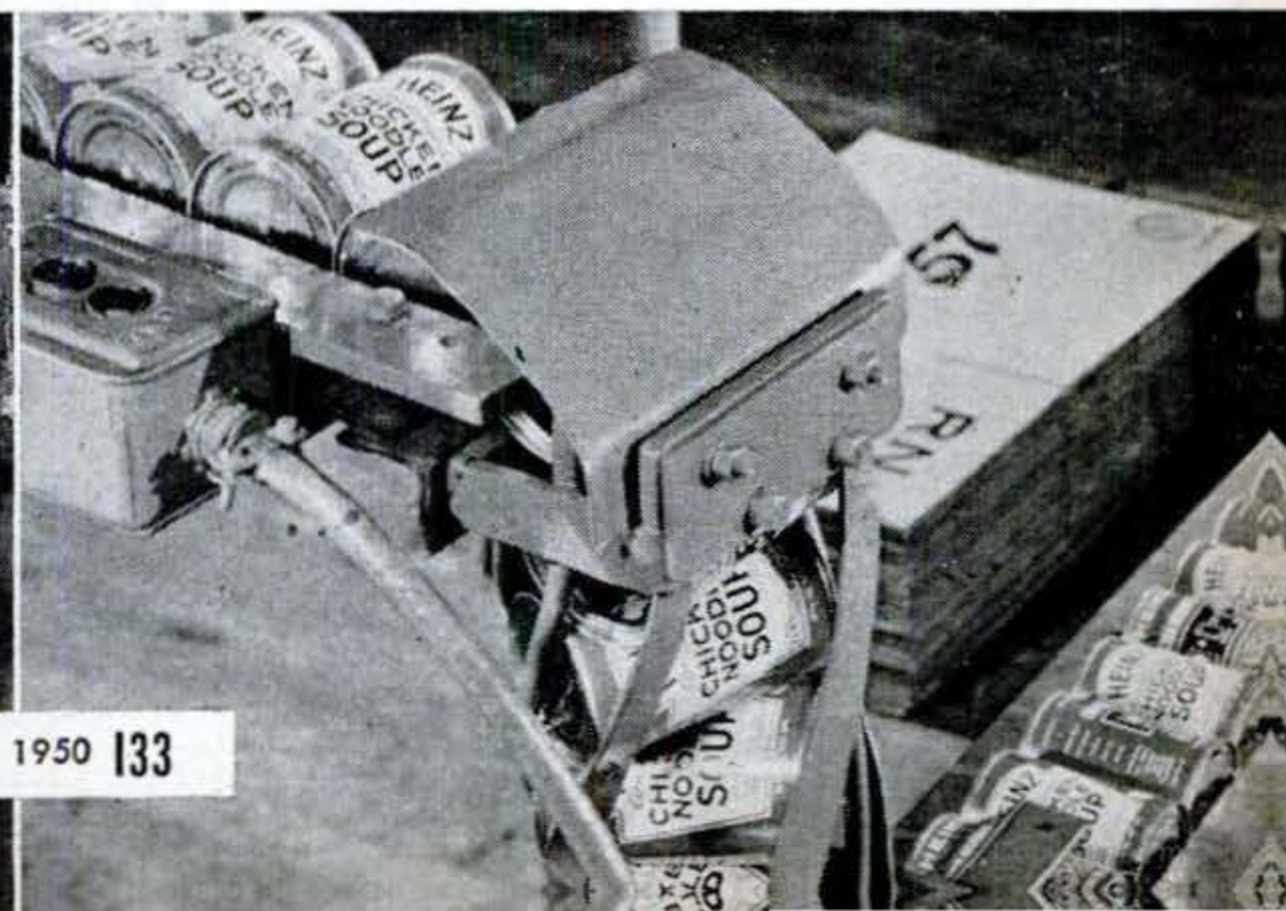
3 AT END OF LINE, strip is coiled into 25,000-lb. rolls. High-frequency current remelts rough electrolytic deposit, makes it smooth and shiny.



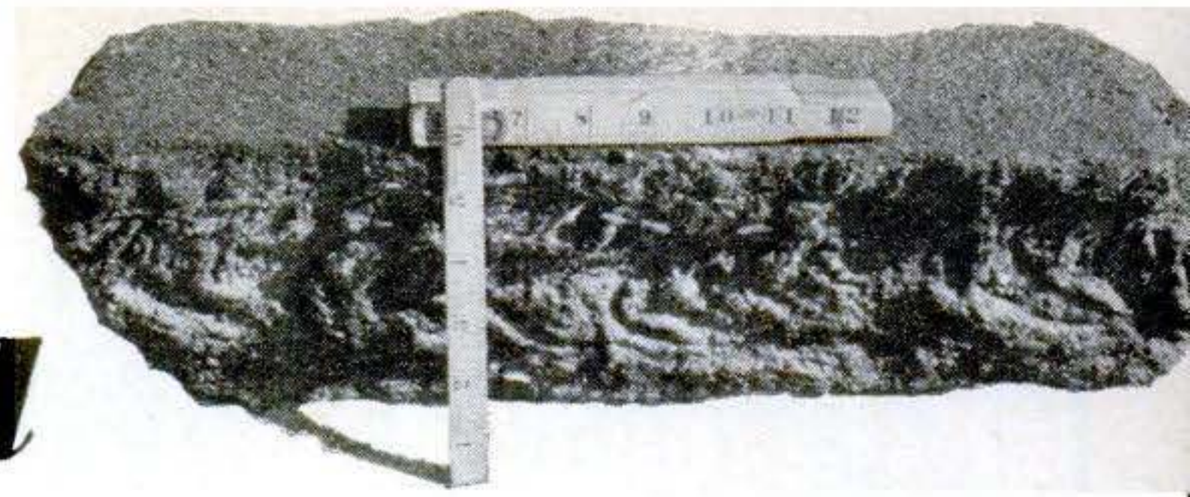
4 AT CAN FACTORY, tin strip is cut into small sheets. Machine above then bends them around cylinder to form can bodies and solders seams.



7 AFTER CAPPING under heat that produces vacuum to keep food fresh, cans are again sterilized in these giant retorts holding 9,600 cans apiece.



8 IN FINAL STEP, cans ride conveyer through automatic labeling machine, then come out here, ready for packing and shipment to grocers' shelves.



Test section cut from finished road shows 5½-inch depth.

Plastic Road Rolled Out on the Run

By George H. Waltz, Jr.

YOU'D have to lope like a marathoner to keep up with the builders of this new type of road. And it not only goes down at eight m.p.h. but it can support heavy traffic within a few hours.

The Navy recently demonstrated the ingenious road-building technique on the sandy beach at Port Hueneme, Calif. A single run over a section of the beach with a train of road-building equipment pulled by a tractor converted it into a road that was hard enough to be used by a jeep in two hours. Within three hours it was able to support a 7½-ton truck. After 48 hours a loaded truck that tipped the scales at 14 tons rolled back and forth over it without leaving a tire mark.

The Navy's new road-building process, the result of research by Dr. Hans Winterkorn of Princeton University, has important civilian possibilities. It requires no special equipment. For the most part, conventional road-building machinery can be used. The secret consists simply of wetting the sand or soil with aniline, furfural resin, and a catalyst, mixing the sand and the chemicals thoroughly, and settling and compacting the mixture with a vibrating metal sled.

During the rapid chemical reaction that follows, the resinous mixture that surrounds each grain of sand or particle of dirt hardens like cement—only very much faster. The result: a durable road surface, 5½ to 6 inches deep. In a sense, it is a road made from plastic that sets at normal outdoor temperatures.

For military landing strips and beachhead roads, building speed is more important than cost. Civilian roads, however, can be built more leisurely and economically. The amount of chemicals used can be cut down and an inexpensive waterproofing material—asphalt, tar, or oil—added to fill out the mixture. It's estimated that a civilian road could be built by such methods at about a tenth the cost of present-day concrete roads.

Dr. Winterkorn is experimenting with a similar chemical method for producing "plasticrete"—a concretelike building material in which resinous materials replace conventional cement. It would be valuable in foundations for buildings and bridge piers

Chemicals are sprayed on the sand or dirt ahead of the mixing machine or soil stabilizer. The chemicals—aniline, furfural resin, and a catalyst—are stored in a large tank mounted on a platform fitted with treads and are fed to the sprayer head under pressure.

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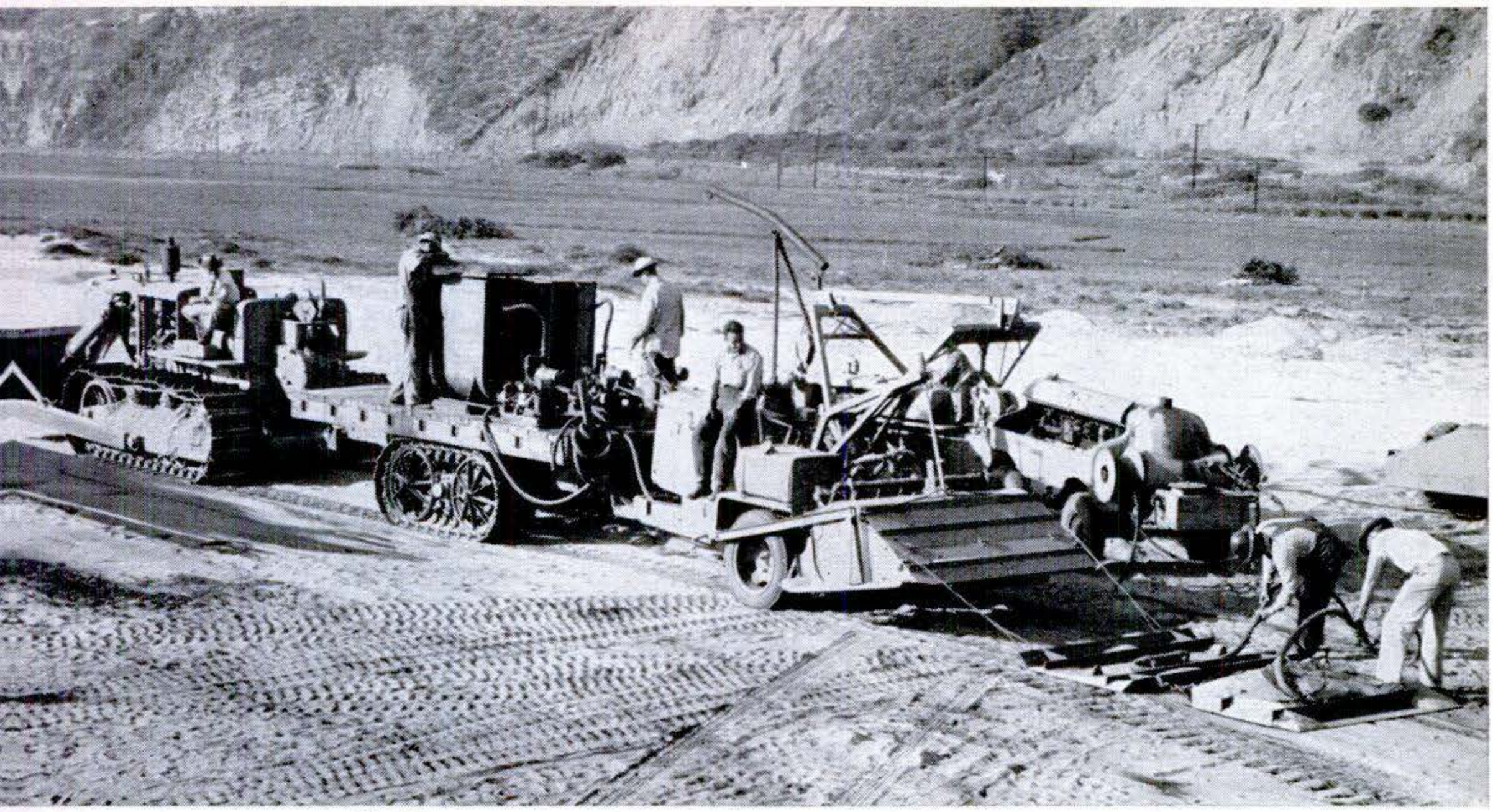
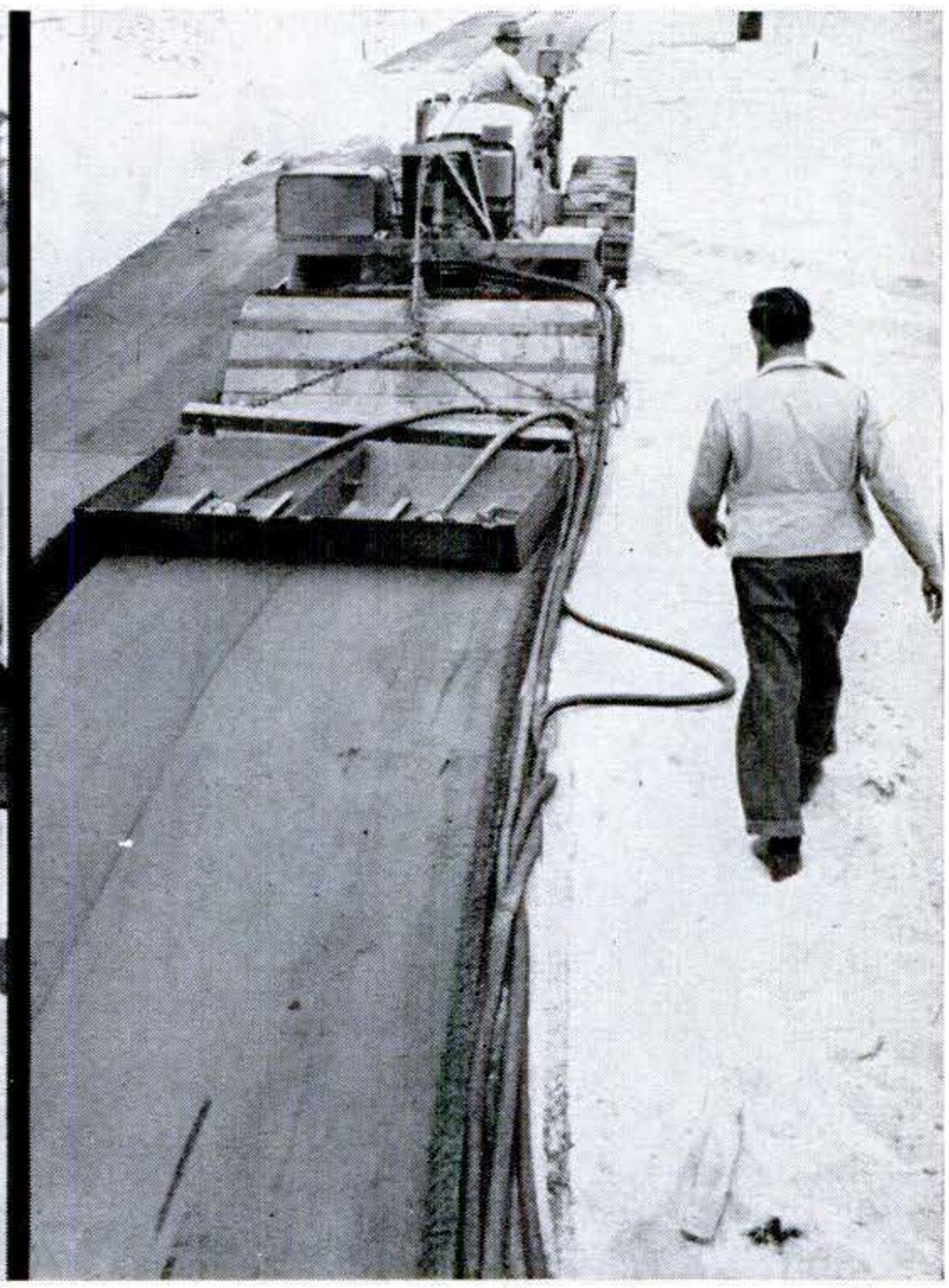


Equipment pulled by tractor can lay the plastic road on a beach at a rate of about 8 m.p.h. Same system with slight modification can be used for building roads on a dirt base. Careful analysis of soil or sand must be made to determine chemical mixture to be employed.

Soil stabilizing machine consists of a series of rotating arms that blend the chemicals into the sand or dirt to form a uniform mixture. Width of the road section is limited only by the size of the soil stabilizer, which is a conventional piece of road-building equipment.



After the chemicals have been sprayed on and mixed with the sand or dirt, the mixture is settled and compacted by a vibrating metal sled, shown above. Air hammers operated by a portable compressor, seen at right in the photo at top of the page, vibrate the sled.

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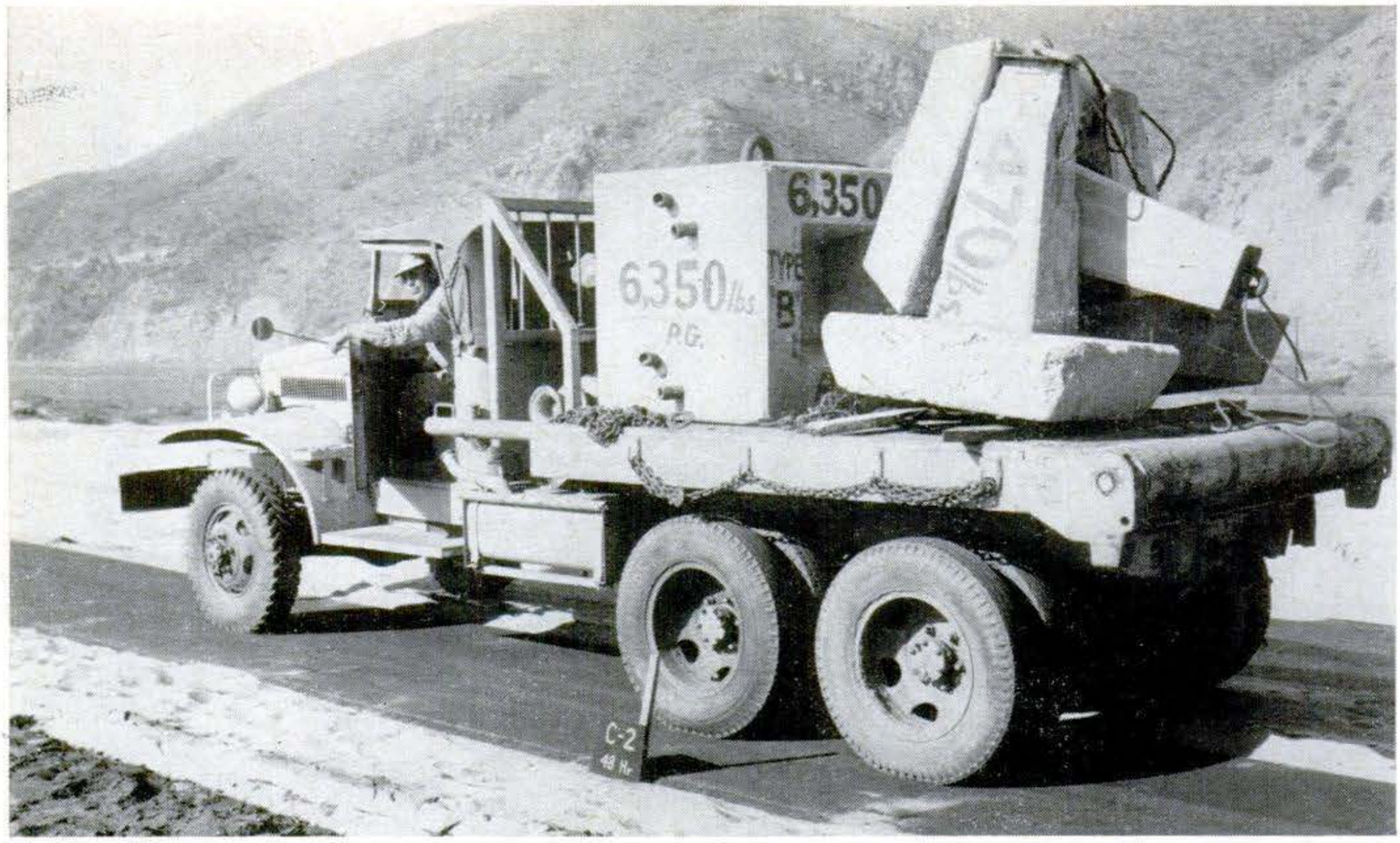


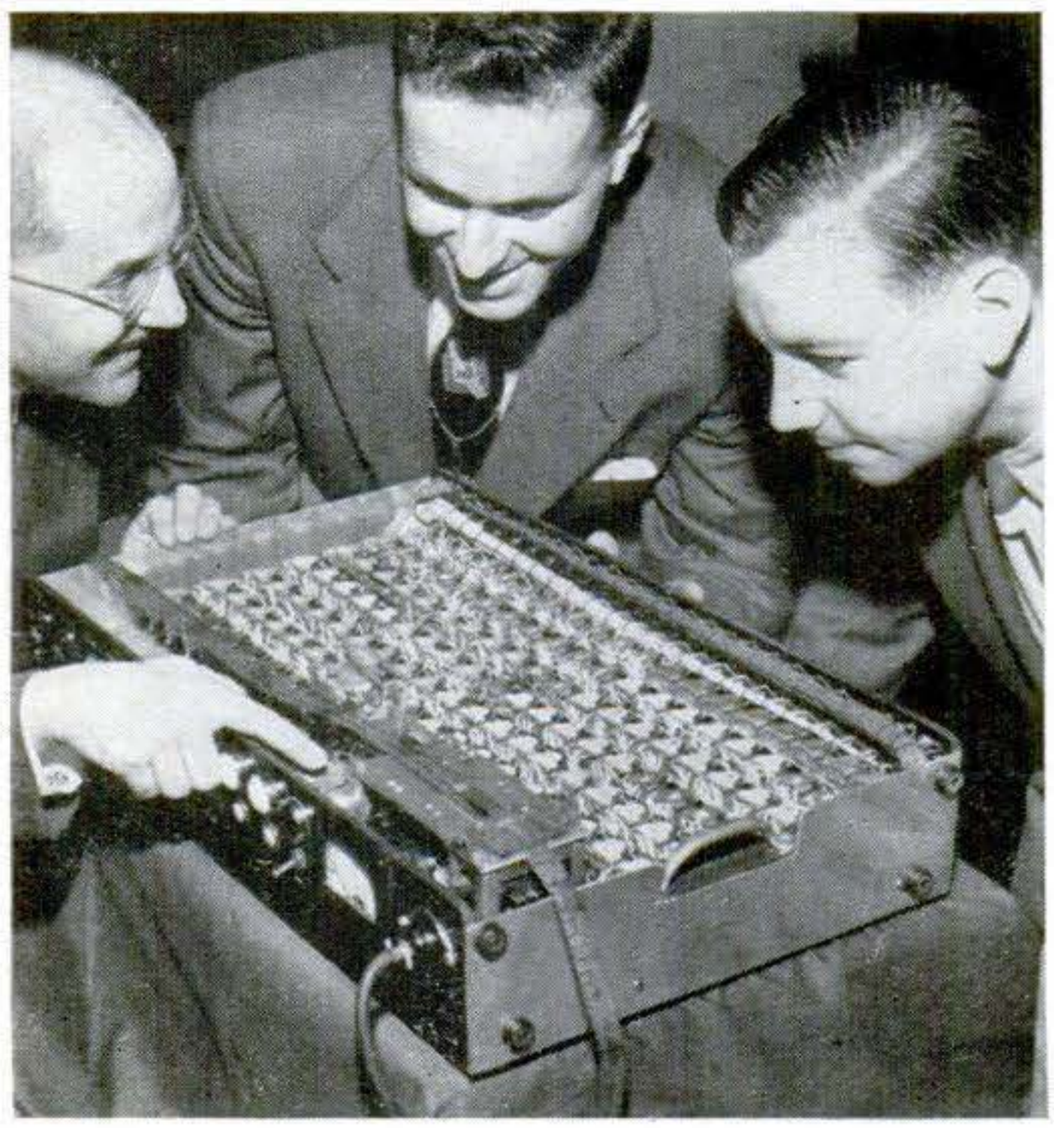
Forty-eight hours after test road was completed on the beach at Port Hueneme, Calif., truck and load weighing about 14 tons rolled over it repeatedly without affecting the surface.

in localities where the chemical make-up of the soils and natural waters causes ordinary concrete to deteriorate.

Both the new plastic roads and plasticrete are developments in a 19-year-old field of experimentation known as "soil stabilization." The oiled road of our rural districts is the simplest form of stabilized road. Its life, however, is short because the oil, which forms the binder or stabilizer, is attacked by soil bacteria. The use of the aniline-furfural mixture, however, not only forms a sturdier road much faster, but is in itself a bactericide.

With newer and more roads becoming a critical national need, soil stabilization with plastics offers an inexpensive and quick answer. In the meantime, it is an ace in the hole if our armed forces ever have to roll down a road that isn't there. END

Dimwit Computer Shows How Big Brains Work



SIMPLE SIMON is the world's smallest and stupidest mechanical brain. It can't even add two and two—three is the highest number it knows. Simon is unable to solve any practical problem. Anything it can do, you could do faster. But Simon is useful for teaching how the big electronic brains work, since it employs their parts and methods for similar computations. It can add, find negatives, select numbers, and pick out the larger of two numbers.

Built at a cost of $540, the demonstration brain reads problems from a paper tape or push-buttons, calculates with a suitcase full of relays, and flashes answers on tiny lights. Edmund C. Berkeley, computer expert (pushing switch in picture at left), designed it. Two Columbia University graduate students, Andrew Vall (center) and Robert A. Jensen (right), finished the construction job.

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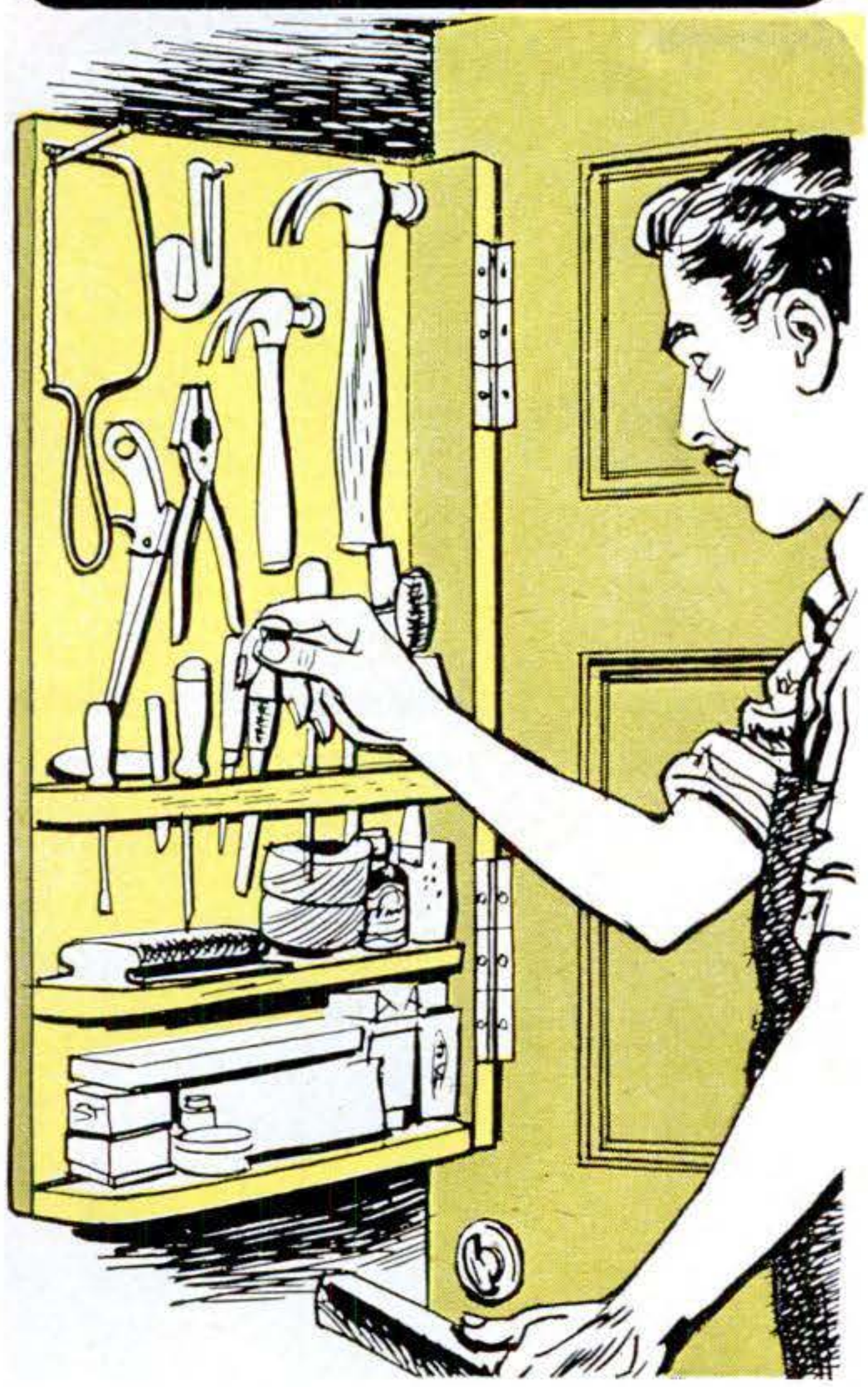
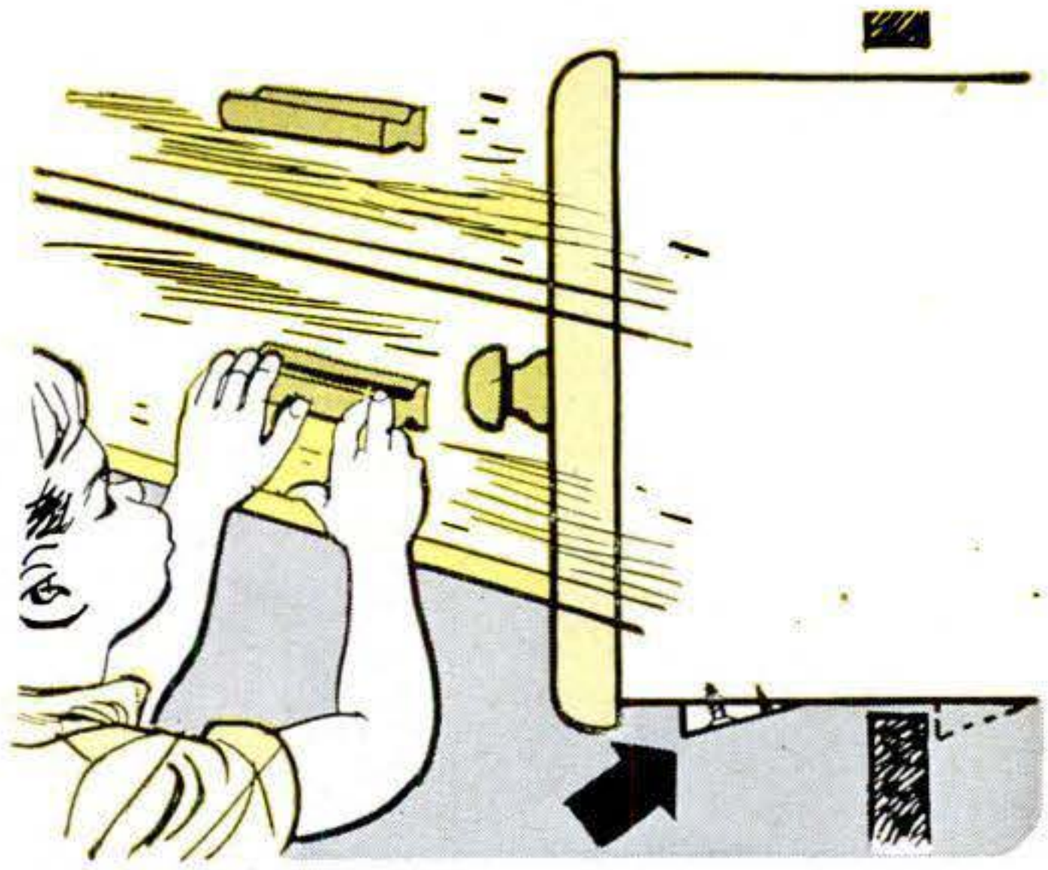
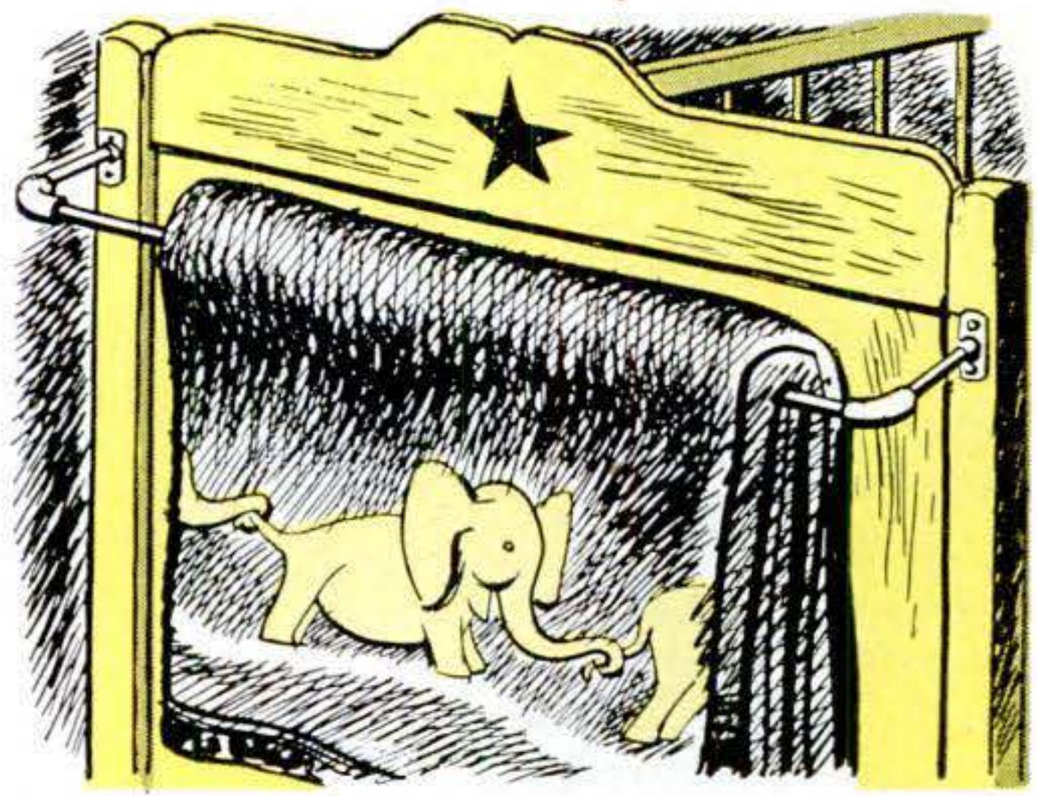
Keeping the Home Shipshape



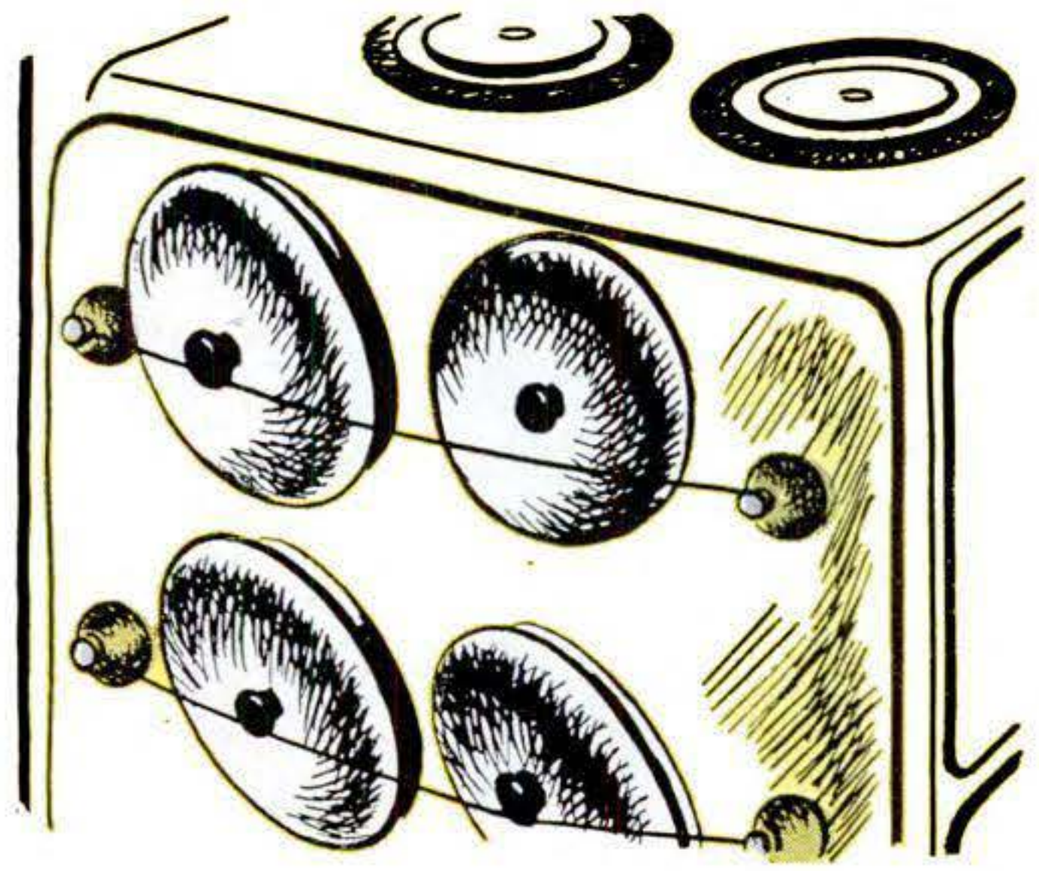
One way to use the waste space on the back of a closet door is to fill it with a rack for tools. If some of the tools tend to roll off, a lip on the shelf will stop them.



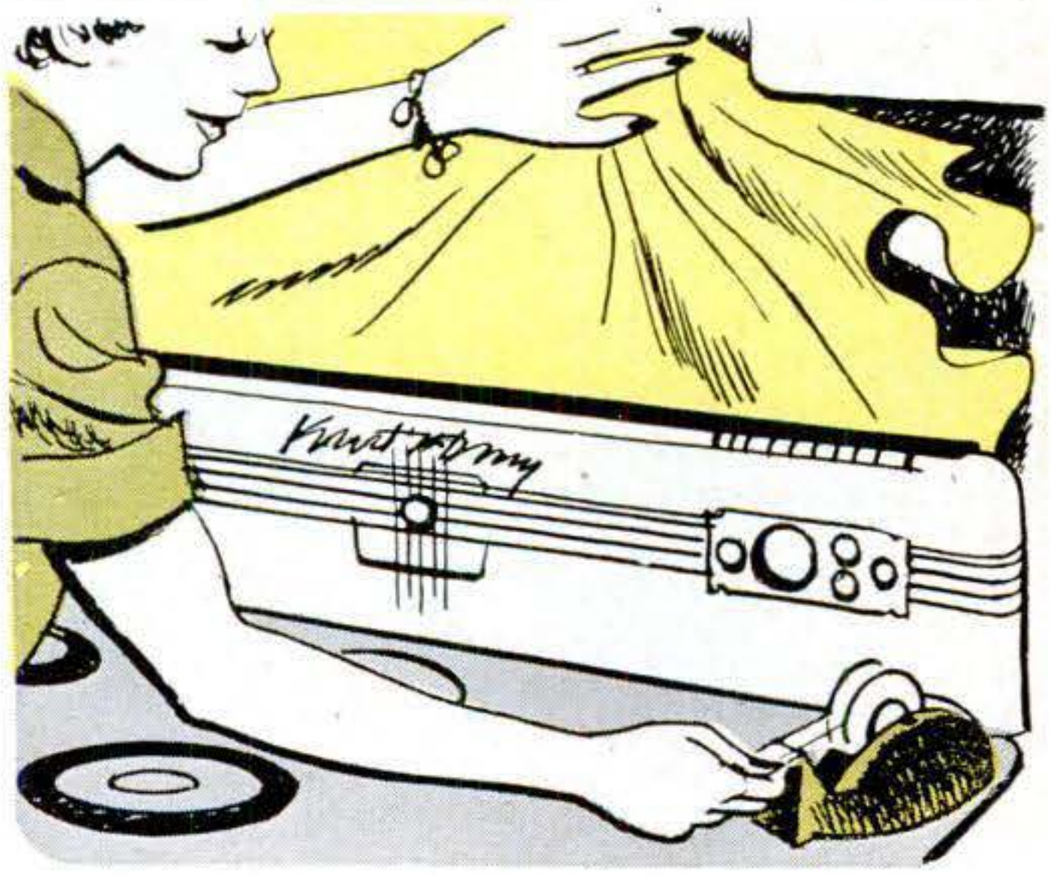
Wedges screwed to the bottom of a drawer keep a small child from opening it. A child tends to pull down on a drawer. An adult can lift the drawer so the wedge clears the spacer.



A pair of drapery brackets and a rod—screwed to the end of a baby's crib—make an excellent rack for hanging blankets and other bedding while you make up the bed.



Racks for pot lids can be made with suction cups and wire. Use cups with a minimum diameter of 2″ and moisten them with glycerin before sticking them on a smooth surface.



Tape a strip of plastic sheeting to the wall area behind the kitchen stove. It's easily cleaned with a damp cloth. Be sure you don't use a plastic that burns readily.

Please turn the page for five more suggestions.

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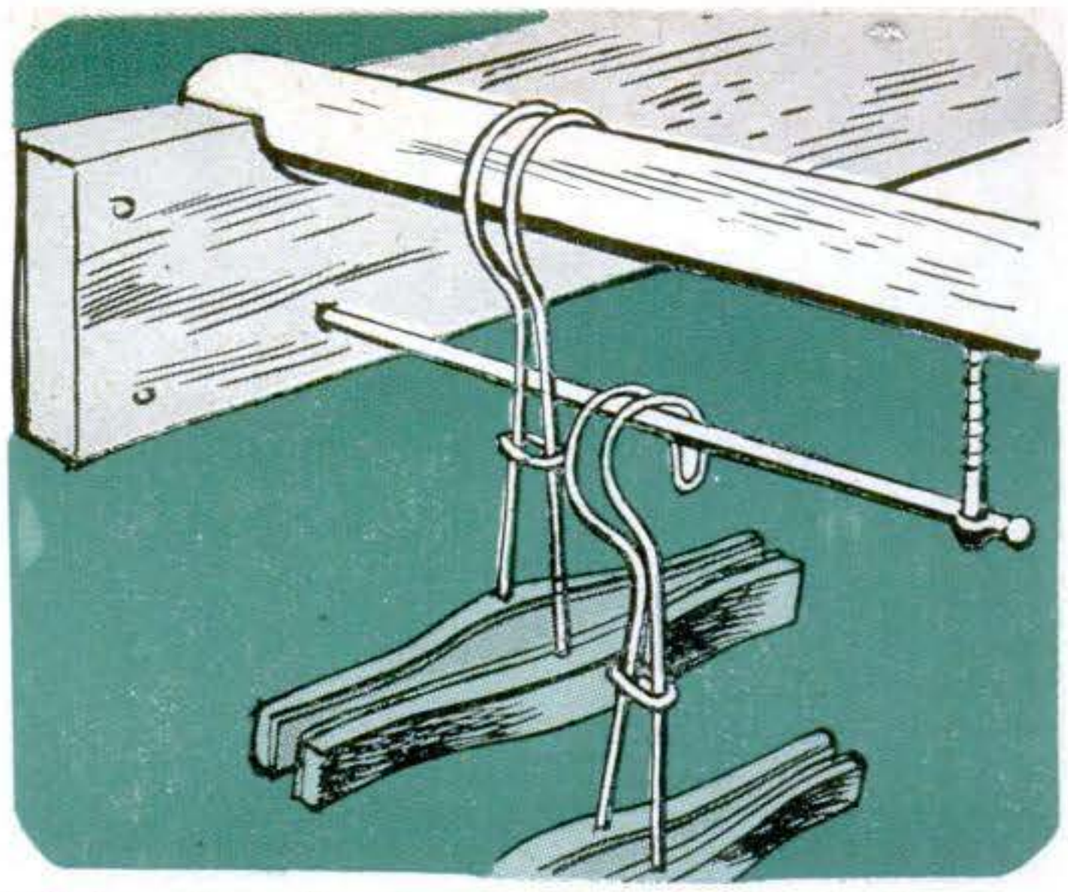
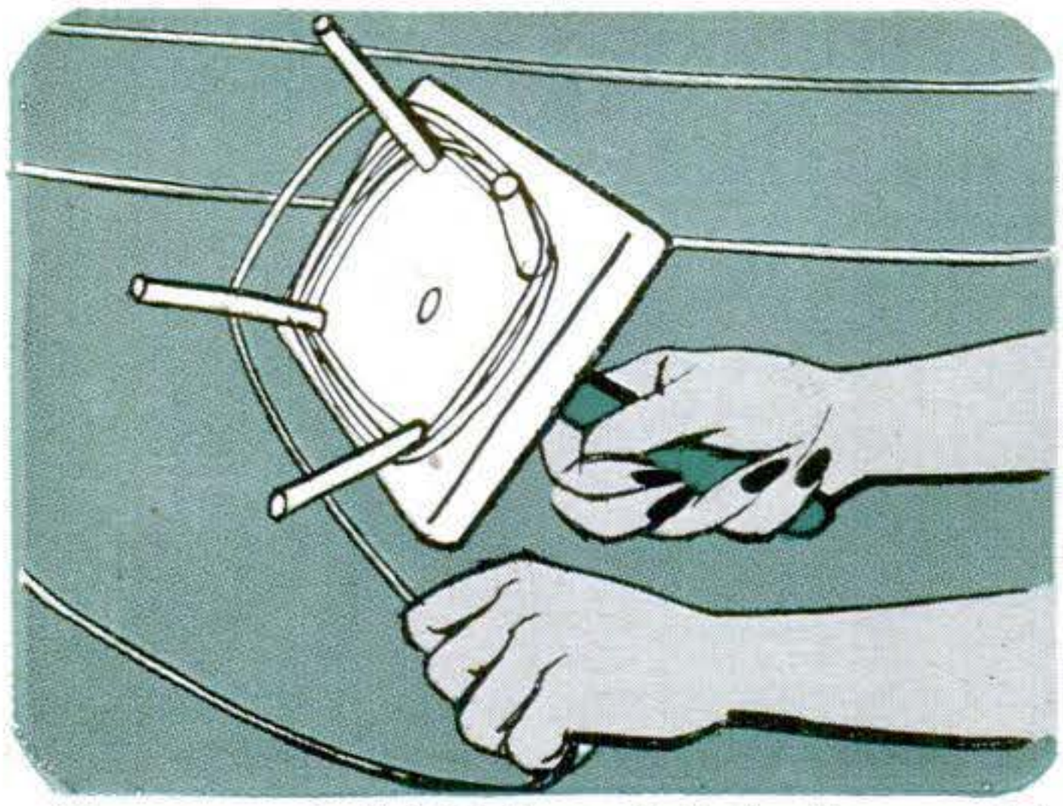
Keeping the Home Shipshape

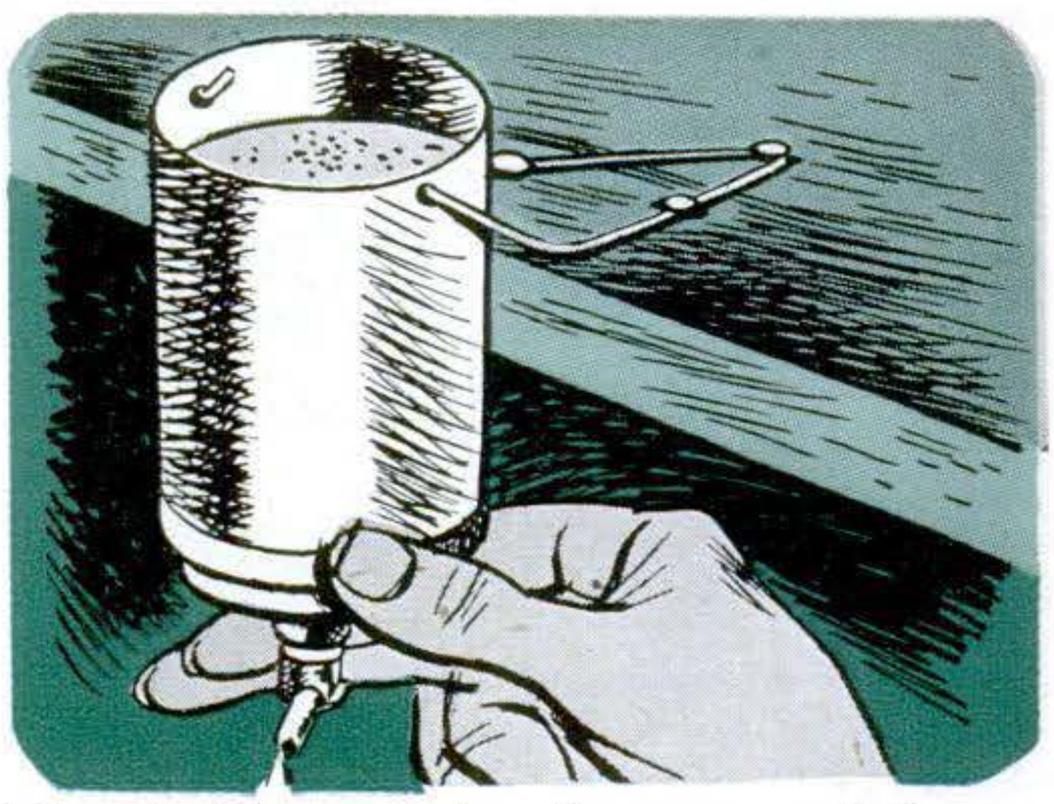
If you need heavy thread—and none is on hand—use two spools of finer thread. Slip a length of drinking straw over the spindle to hold both spools, and thread the machine.



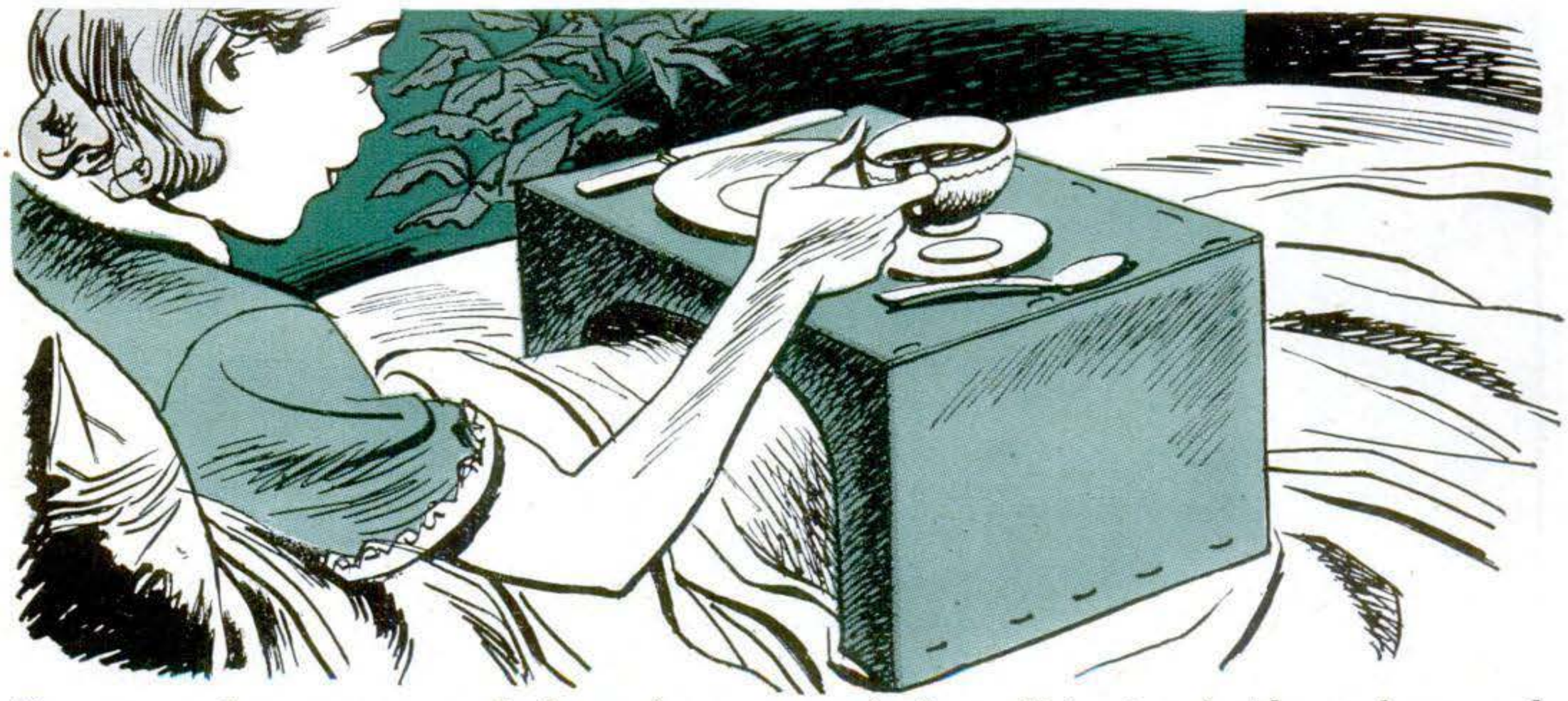
With a length of curtain rod attached to a clothes pole, your closet will accommodate about one-third more trouser hangers by alternating them on the upper and lower rods.



You can wind 100 feet of clothesline on this reel without kinking the rope. It's a 1″ by 6″ by 10″ piece of pine with dowels in each corner. The handle is a section of broomstick.



A handy dispenser for oils or soap solutions can be made by cutting off the bottom of a used whipped-cream container. Punch holes near the end and support the can by wires.



You can make a temporary bed tray from a corrugated carton. Fold the flaps inside and staple them. Cut out each side, as shown, and cover the top with a piece of cloth.

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Plastic Covers Save Seats

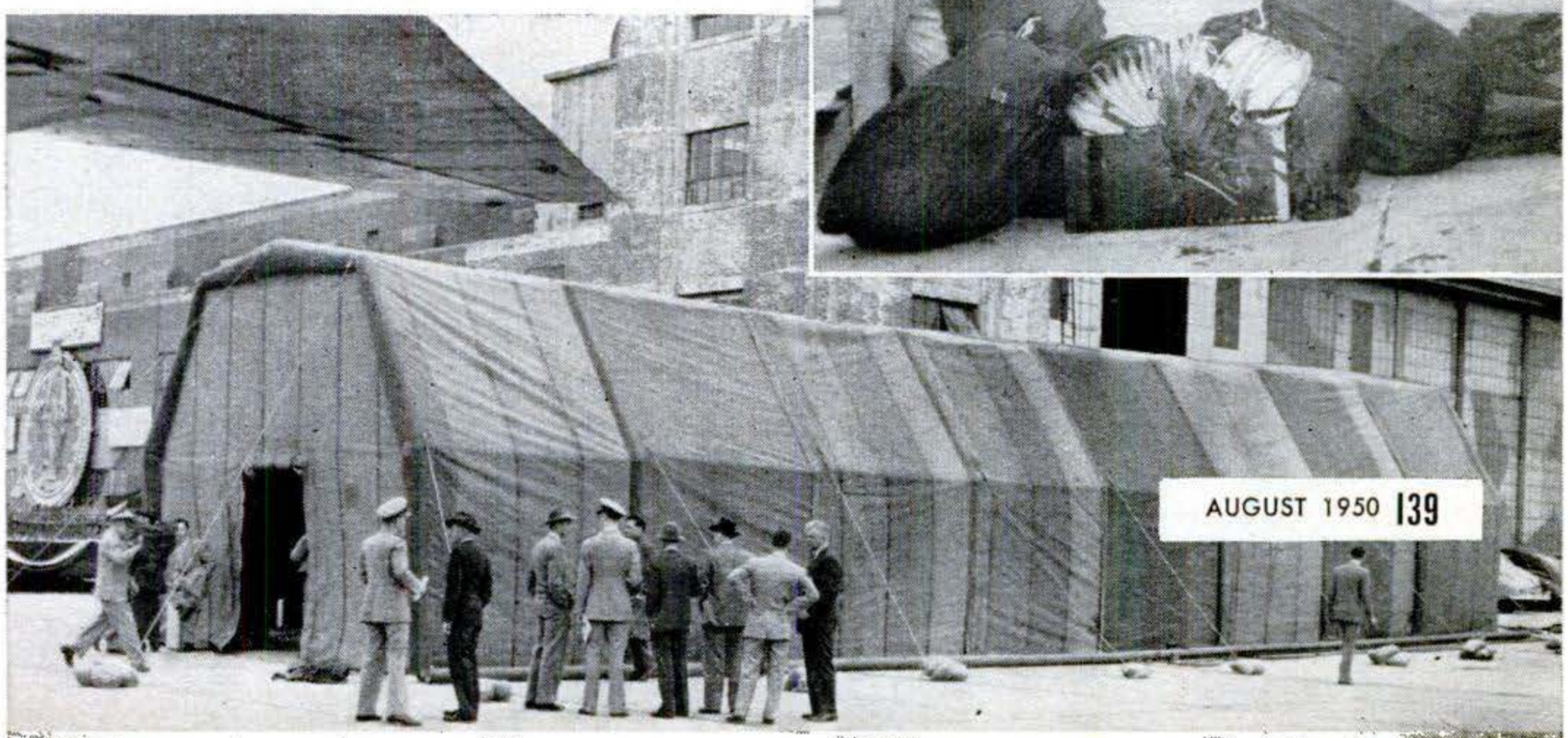
WET swim suits, pets, or children can't harm auto upholstery protected by this loose-fitting, plastic seat cover, originally made to safeguard seats during repair work. The vinyl material resists most damaging substances, and wipes clean with a damp cloth. The Cover-All, marketed by Charles Burgoon & Co., Akron, Ohio, sells for $3.95.

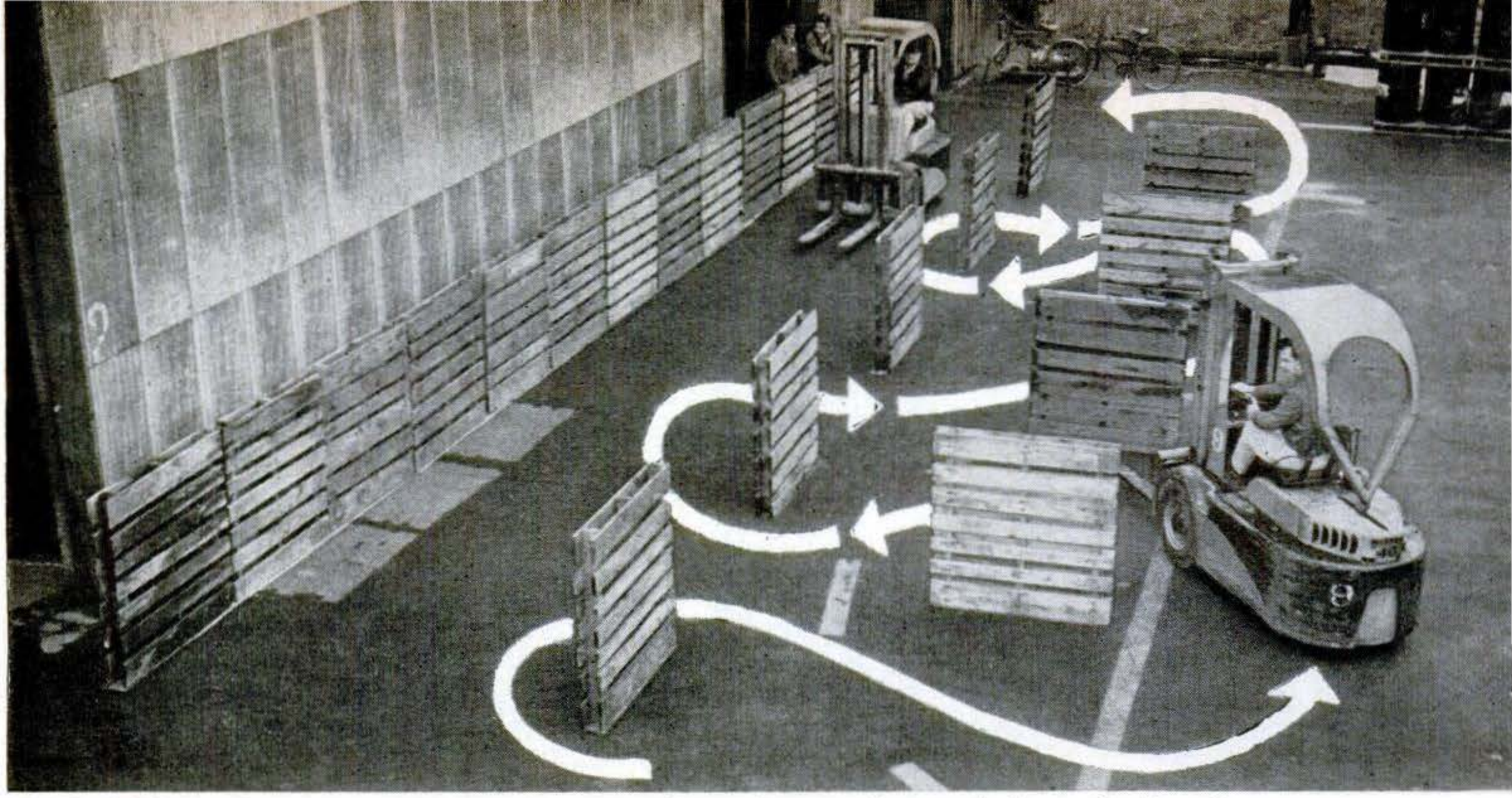
Locked Blocks Need No Mortar

NEW concrete blocks that fit so tightly they need no mortar make it easy for amateurs to erect strong and straight masonry walls like the one at top. The secret is a tongue-and-groove joint—somewhat like that used in cabinetmaking—that locks the blocks together as above. Mastic, applied to the joints with a calking gun, prevents water seepage. A special machine, sold by Hydro-Forged Stone Associates, Cleveland, forms each block under 150 tons pressure to a tolerance of .005". No exterior or interior finish is needed, says the manufacturer, who claims costs far below those of brick or lumber construction.

Air Columns Support Big Tent

COLUMNS of air hold up the building below, 80 feet long and as big as a four-room house. It's a portable darkroom and briefing tent, made for the Air Force by B. F. Goodrich Co. The supporting columns are U-shaped tubes of rubberized nylon and glass fiber inflated with three pounds of air. The 740-lb. structure, which uses 320 feet of zippers, packs in eight bags (right).





Skill of lift-truck operators is tested on complicated route (arrows) through obstacle course.

Obstacles Test Fork Drivers

How'd you like to try this one? Operators must carry load down 40-foot aisle—there's two-inch clearance—drop the load, back up and raise forks, pick up load again, and back all way out.

BROKEN-FIELD running is hard enough in a football game. But imagine trying it on a motor scooter toting a load of barrels! That's what operators of fork-lift trucks at the Esso Standard Oil Co.'s Bayway Refinery have to do.

Their motorized broken-field running is done on an obstacle course made by lining up pallets—wooden load platforms. Here their skill at maneuvering the trucks in tight quarters is tested as part of a safety training program. Actually, the warehouses where they work every day offer almost as difficult obstacle courses—narrow aisles and doorways obstructed by pillars and stacks of goods.

These tricky little trucks, so valuable to industry for their amazing talent at shuffling man-crushing loads, can also be very dangerous if improperly handled. The cramped working quarters and quick-turning ability of the trucks make collisions with people or obstructions all too easy. Loads can topple off or upset the trucks. Even when parked, the trucks can be a hazard—passersby may trip over the forks. The Bayway training program was started after three serious accidents—in one the operator was killed—underscored these dangers.

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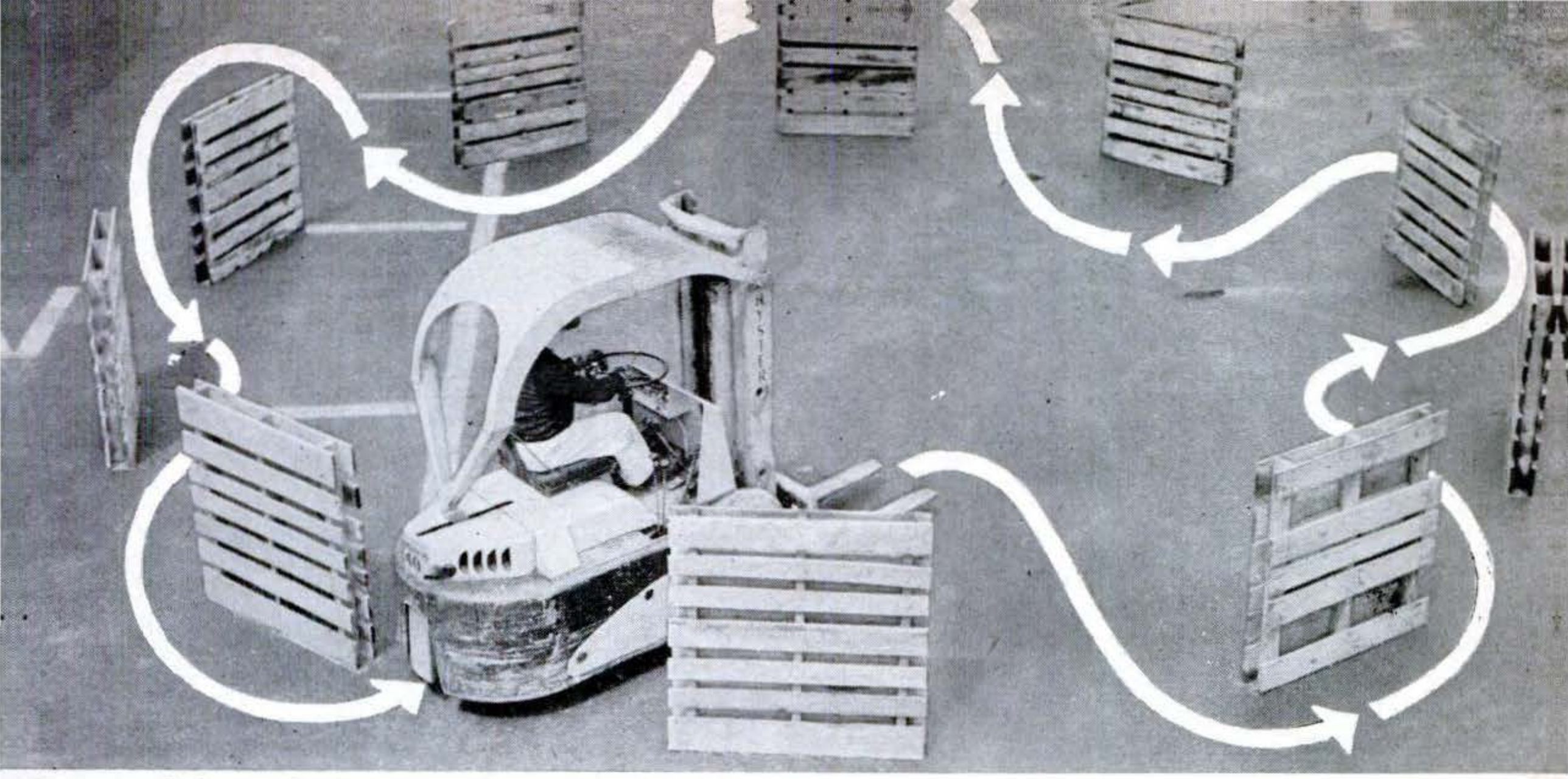
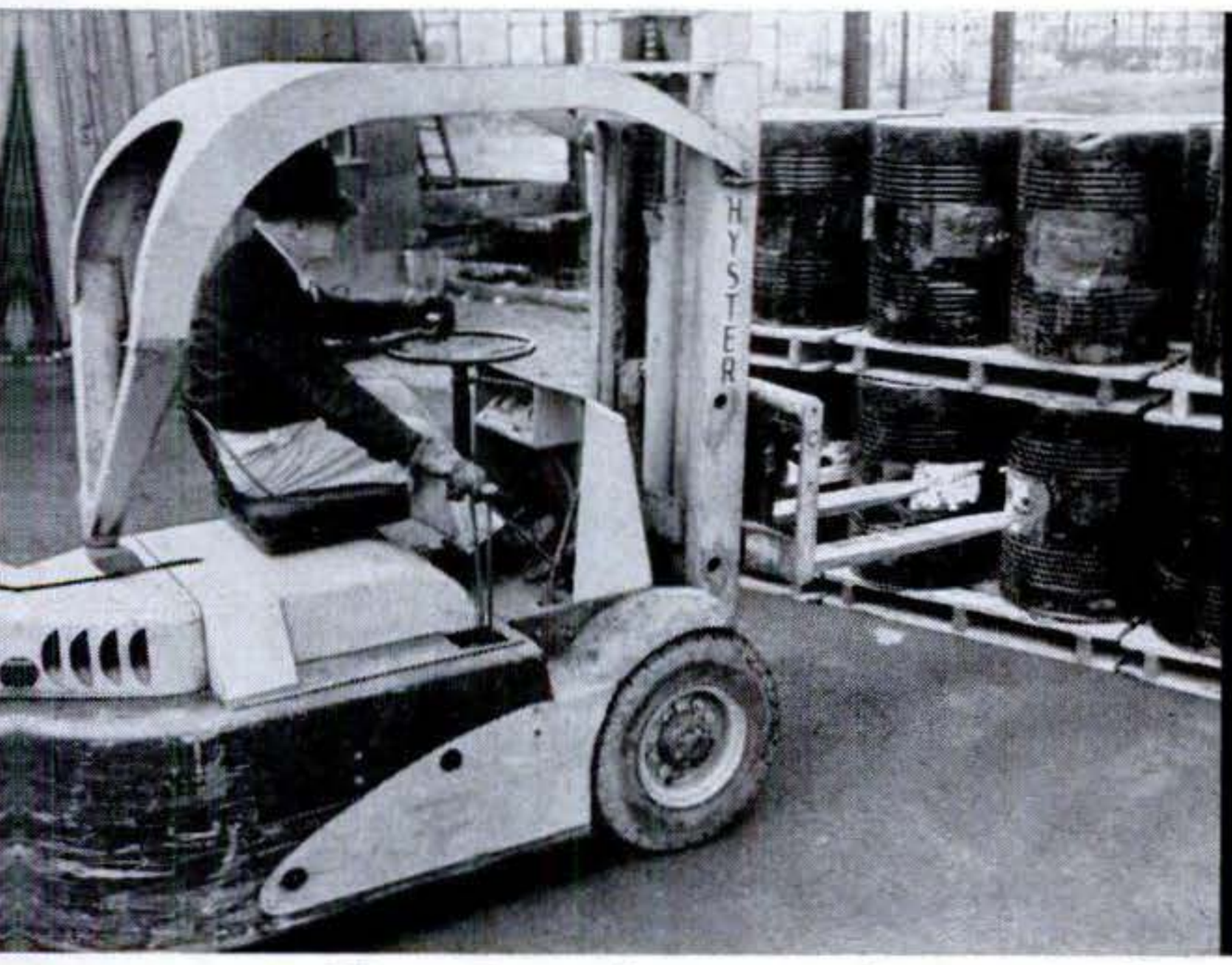
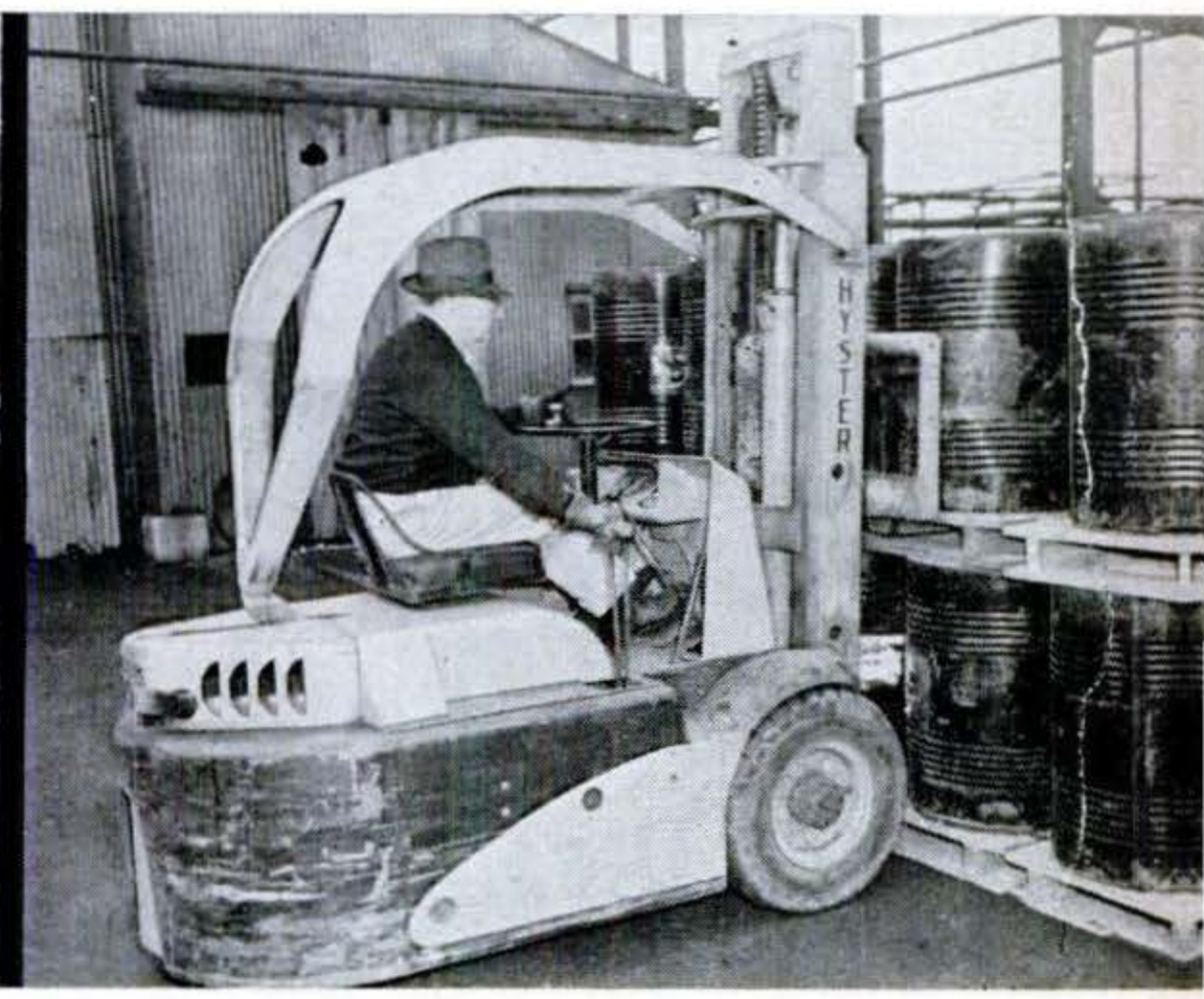


Lift trucks can turn sharp corners—but there is only inches clearance between obstacles.



1 **Marty Ryan,** foreman at the Bayway plant, shows how the truck can pick up that center drum stack. Here he sets forks to pallet level.



2 **Next he lets the truck coast forward** until the forks slide all the way into the slots in the pallet. Forks must be centered under load.

3 **Whole frame** tilts back to cradle load on forks as it is lifted. Outside lever controls amount of tilt; inner lever raises, lowers forks.

4 **Then truck is backed out** and clear of stack. Forks will be lowered to within few inches of ground so operator can see over load.

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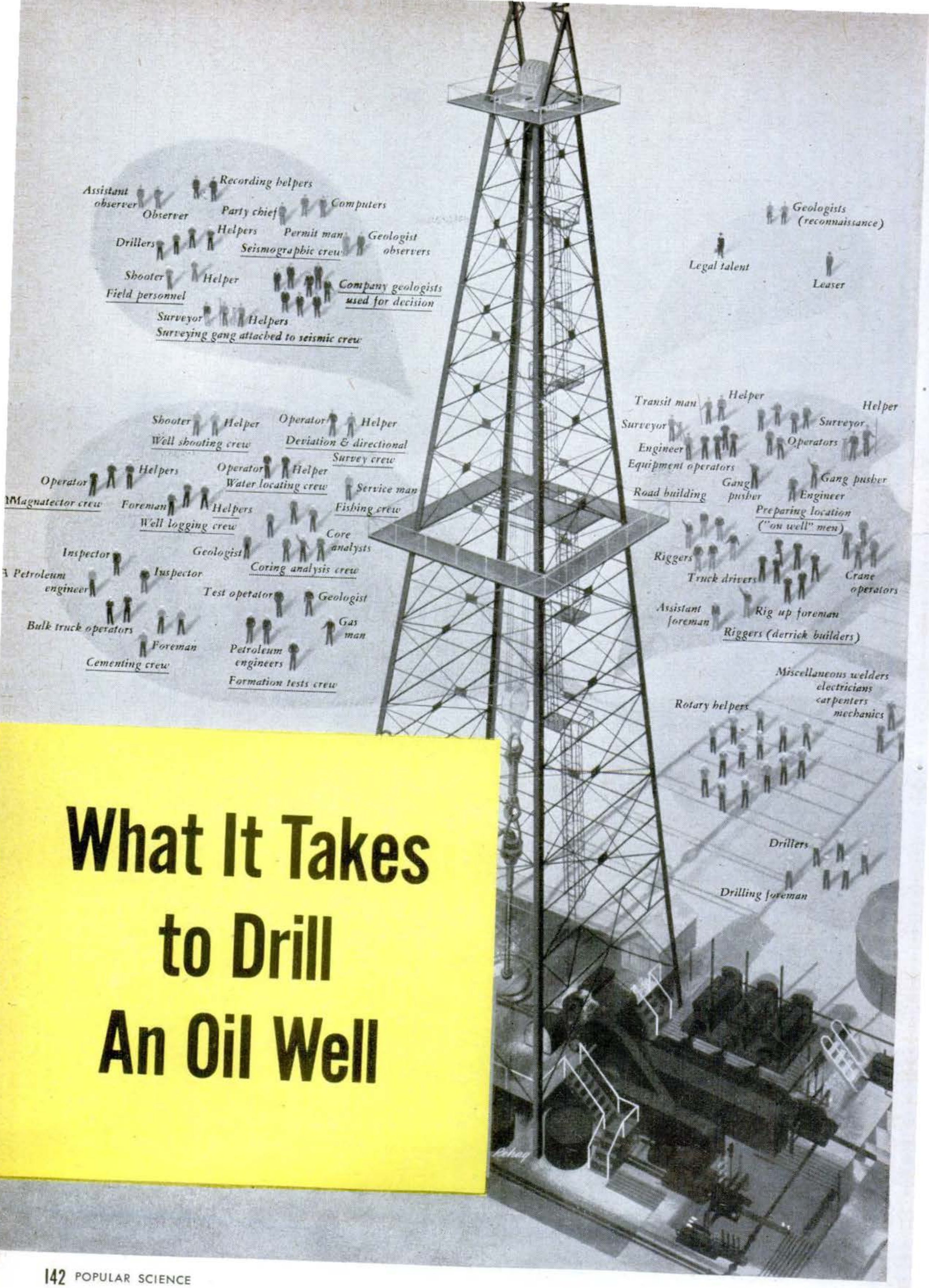

What It Takes to Drill An Oil Well

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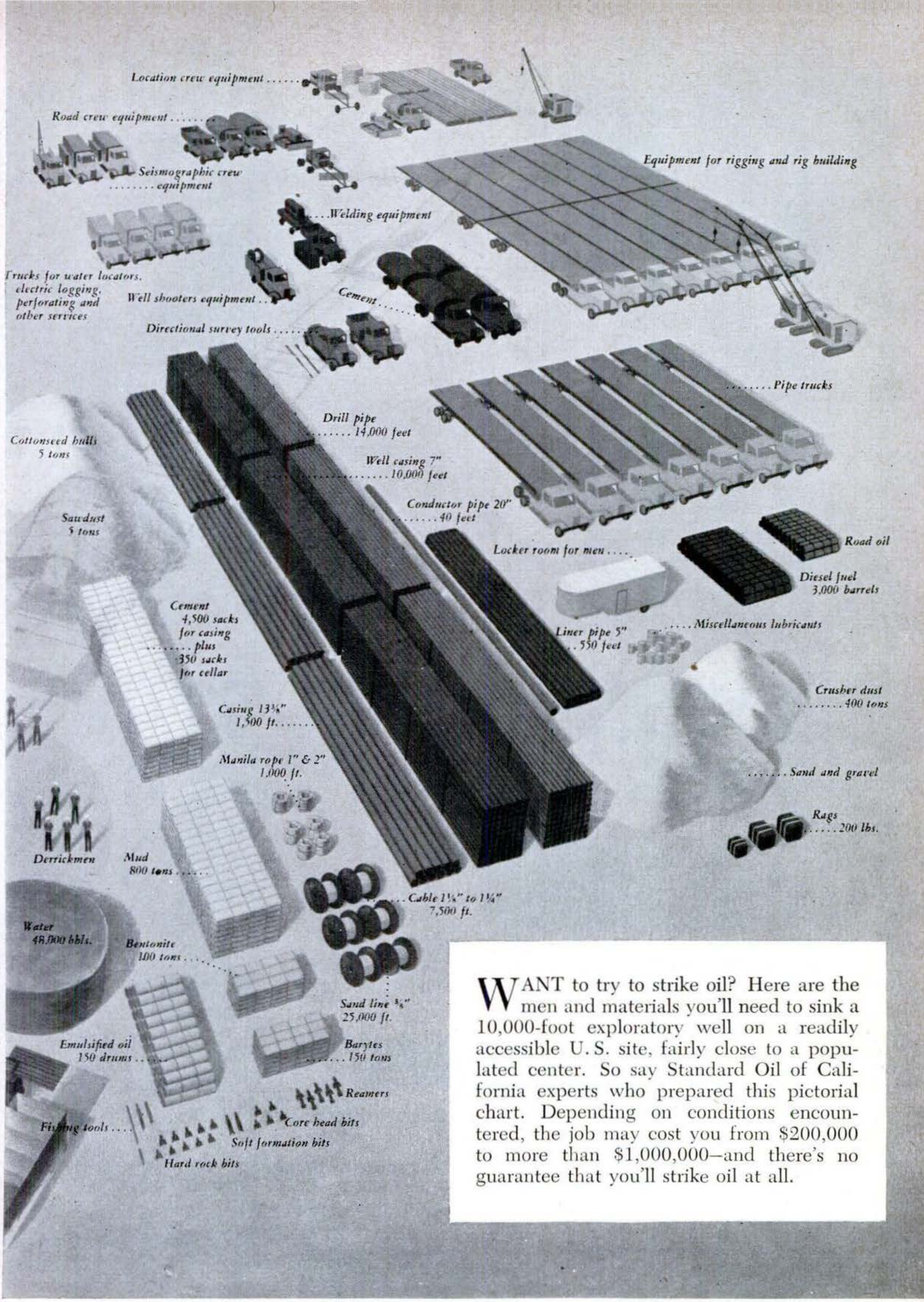

WANT to try to strike oil? Here are the men and materials you'll need to sink a 10,000-foot exploratory well on a readily accessible U. S. site, fairly close to a populated center. So say Standard Oil of California experts who prepared this pictorial chart. Depending on conditions encountered, the job may cost you from $200,000 to more than $1,000,000—and there's no guarantee that you'll strike oil at all.

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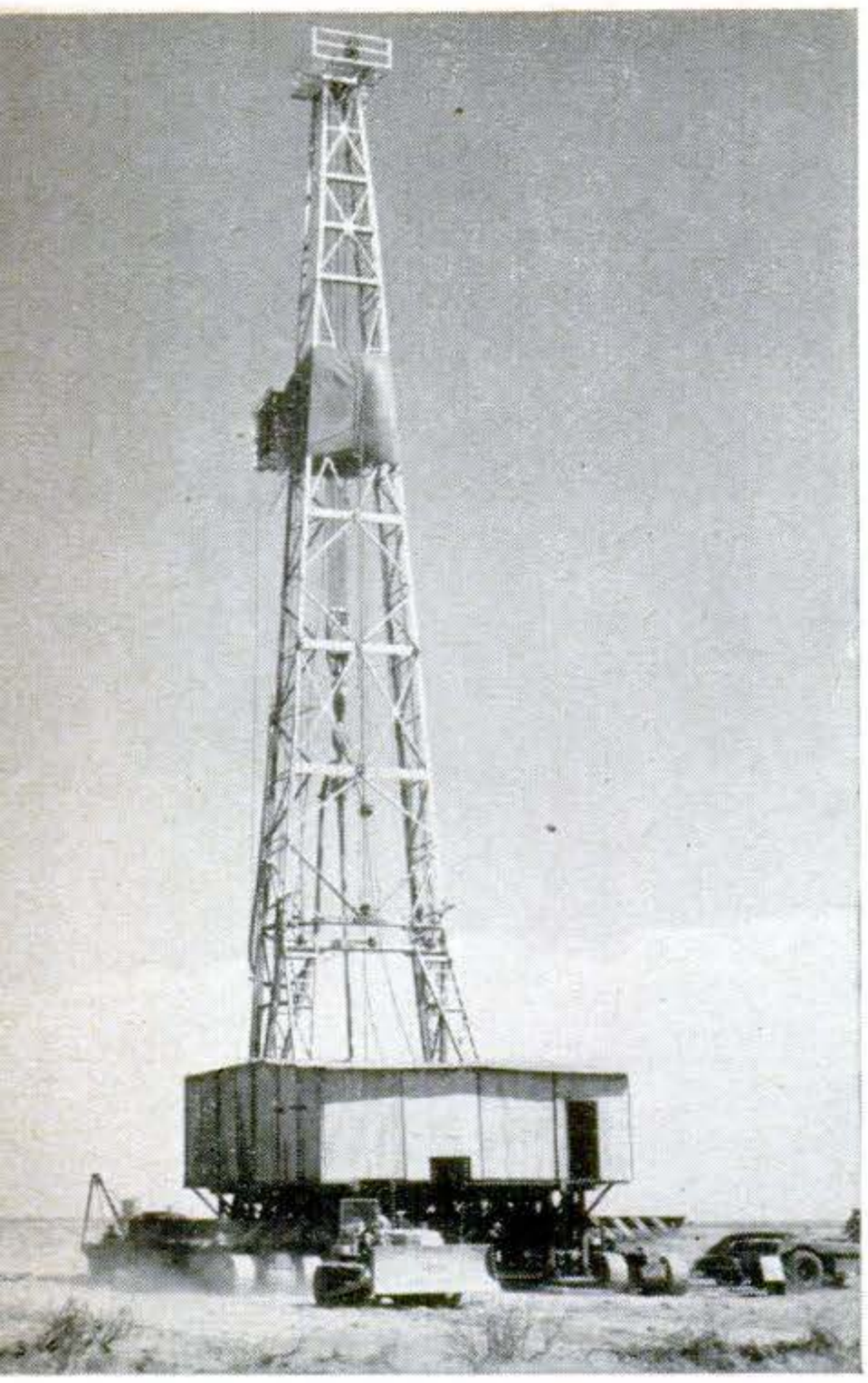
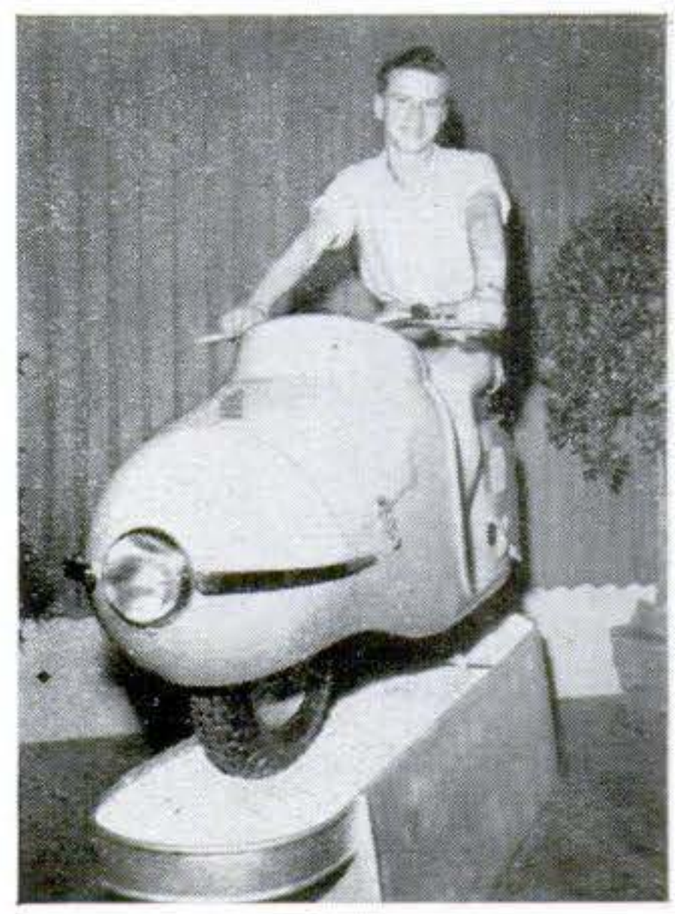


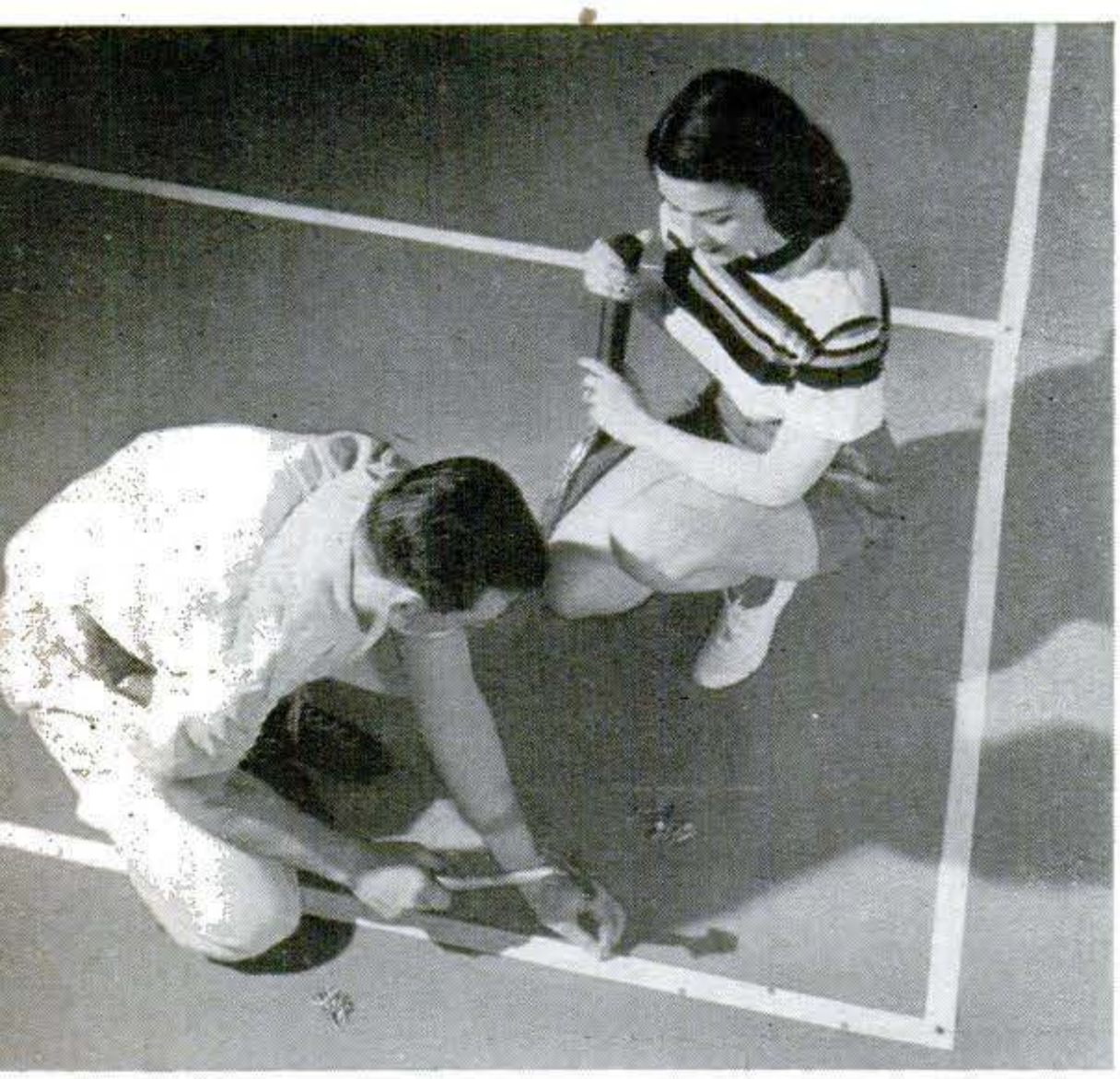
Pre-Assembled Rig Saves Time

WHEN Shell Oil Co. prospectors make wildcat tests on the plains of West Texas, they take along a drilling rig that's already assembled. This way they don't have to take it apart and put it together again every time they move. During the moving operation, known as "skidding a derrick," the rig is raised by jacks, and endless-track belts are placed underneath it, as at left. A tractor then pulls the rig away.

Streamlined Motor Scooter

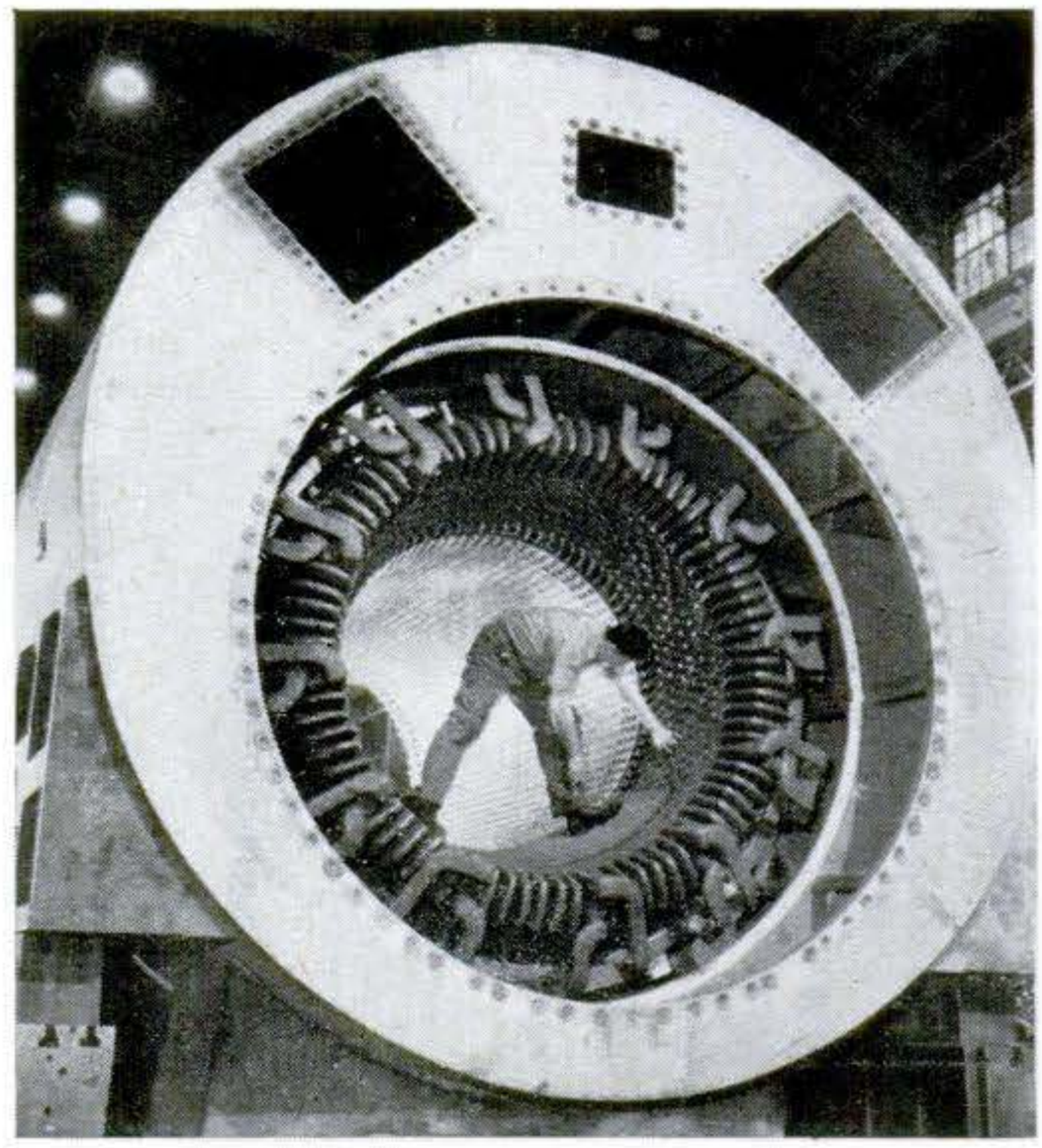
SHAPED like a rocket, the motor scooter at right is said to travel about 95 miles on a gallon of fuel, and to have a top speed of 40 miles per hour. Made in Germany, the scooter has a 120-cubic-centimeter engine. It sells for less than $300.





Plastic Tapes Tennis Courts

LINES marked on a tennis court with this new vinyl tape are said to stay white longer and to resist chemicals, sunlight, and dampness. Here a heavy-duty type is being hammered into the ground with aluminum nails driven through holes at two-inch intervals. A lighter grade is stapled down. Rex Corp., Cambridge, Mass., makes the tape.



Generator Uses New Insulation

THE workman inside this huge 100,000 kilowatt Westinghouse generator is checking the stator coils impregnated with a new insulation that is expected to last 10 times longer than previous types. Called Thermalastic, it consists of mica flakes imbedded in synthetic resin that "stretches" to expand and contract with the generator coils.

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Three miniature racers compete in back-yard version of the Indianapolis Speedway classic.

Autos Race In Your Back Yard

NOW you can get all the thrills of high-speed auto racing without leaving your back yard. Engines scarcely larger than your thumb drive model racers around a track with a 40° bank at 30 miles an hour. The track comes in six sections, and in bad weather you can set it up in the garage or store it away in the attic. You can either buy the midget racers ready-made, or just get a power package, complete with engine and driving wheels, and build the body. L. M. Cox, Santa Ana, Calif., dreamed up the Thimble Drome.

Ralph DePalma, veteran racing driver, examines a fancy version of the midget. The cars burn castor oil and alcohol, put out 1/24 hp. at 20,000 r.p.m. *[Continued on next page]*

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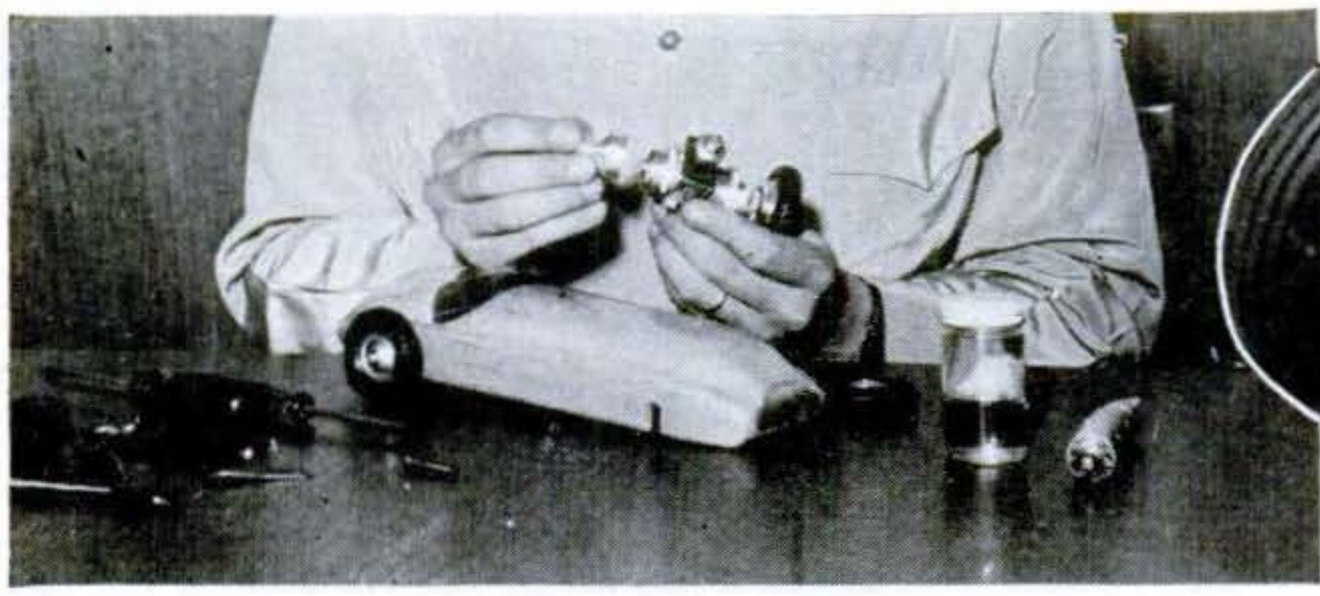
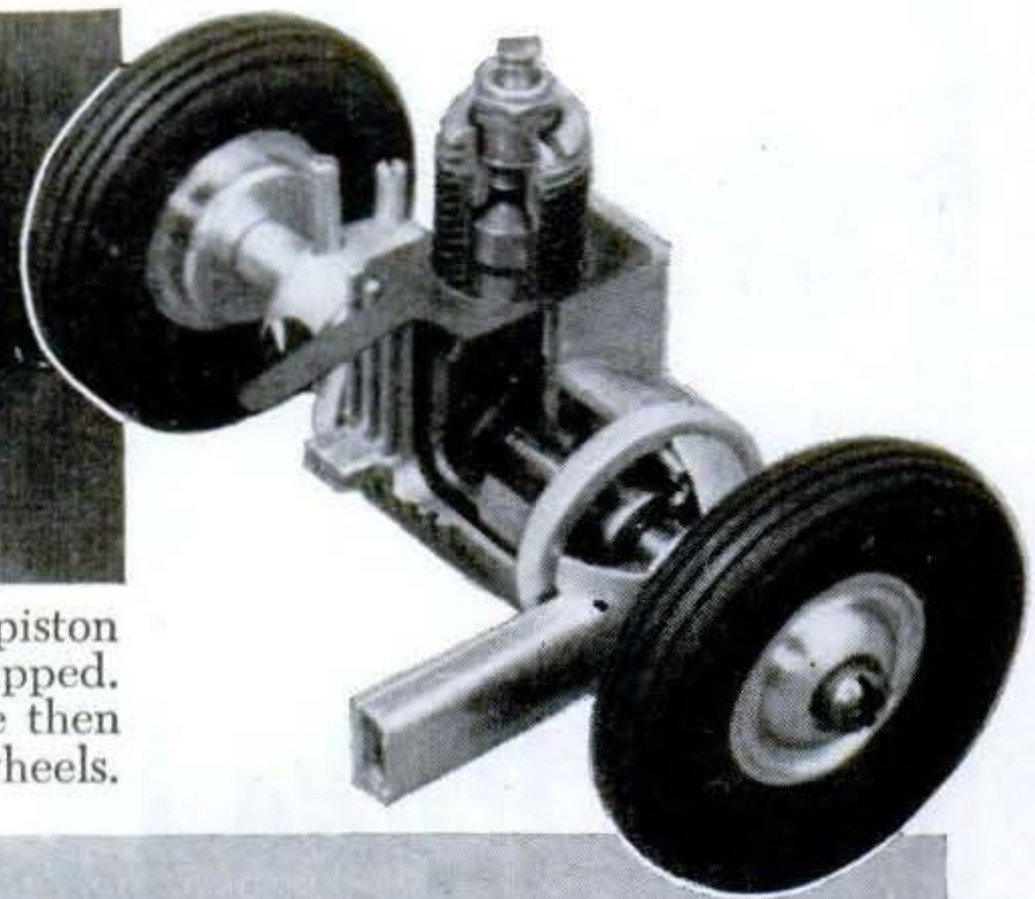
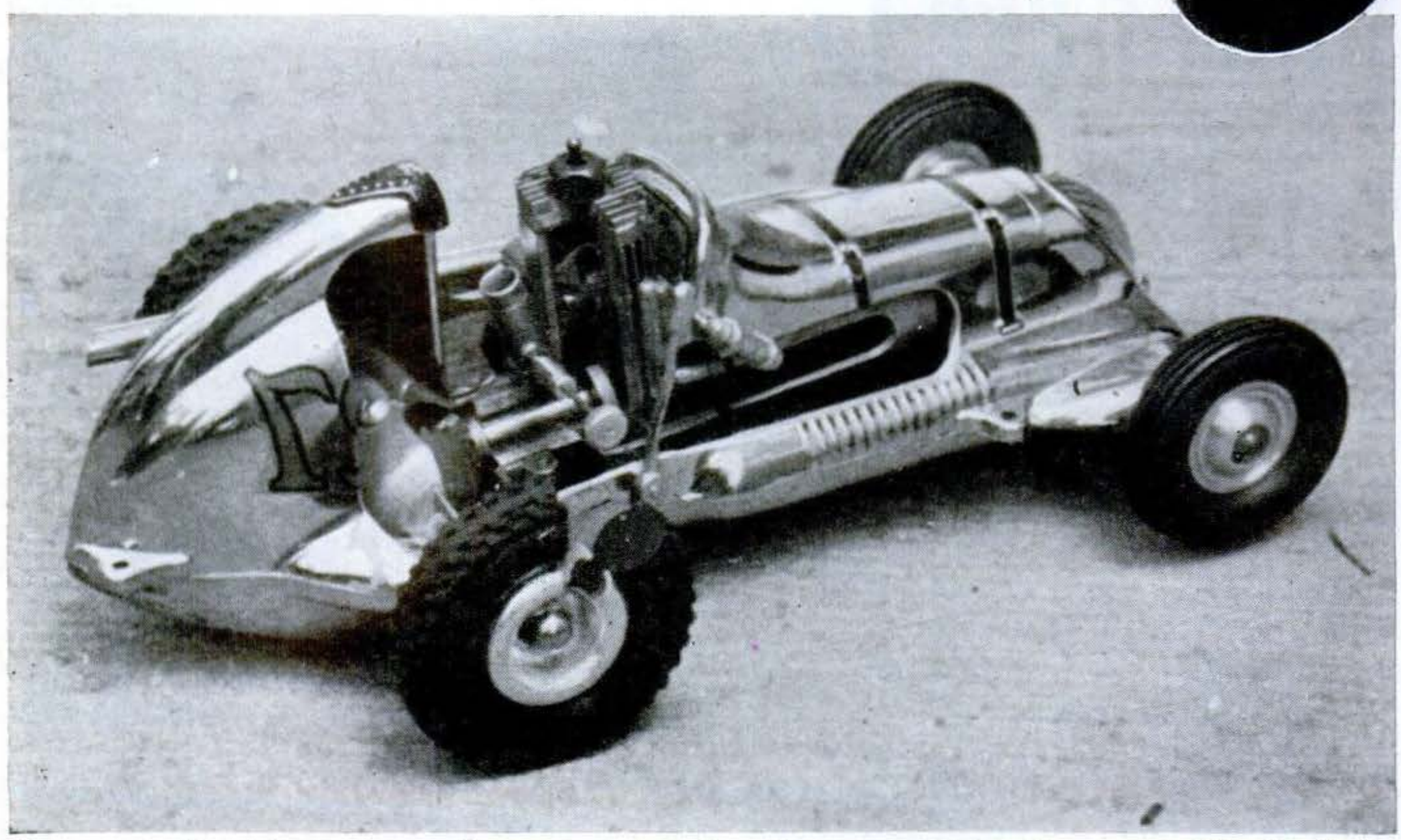
Young drivers line up their entries at the starting post. Guide pins in track slots keep the cars in line along the closed-circuit course. Mufflers as big as two kitchen matches lessen noise.





Two-cycle engine has ⅜-in. bore, .416-in. stroke, piston displacement of .045 cu. in. Cylinder and piston are lapped. Battery heats glow plug to fire fuel in starting; engine then has self-ignition. A 4-to-1 planetary-gear rig drives wheels.



Rear end of miniature racer is cut away to show how power plant is mounted in the body.

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The Quintot high chair serves baby at mealtime. It will double as a car seat, and adjustable back and footrest make it a temporary bed.

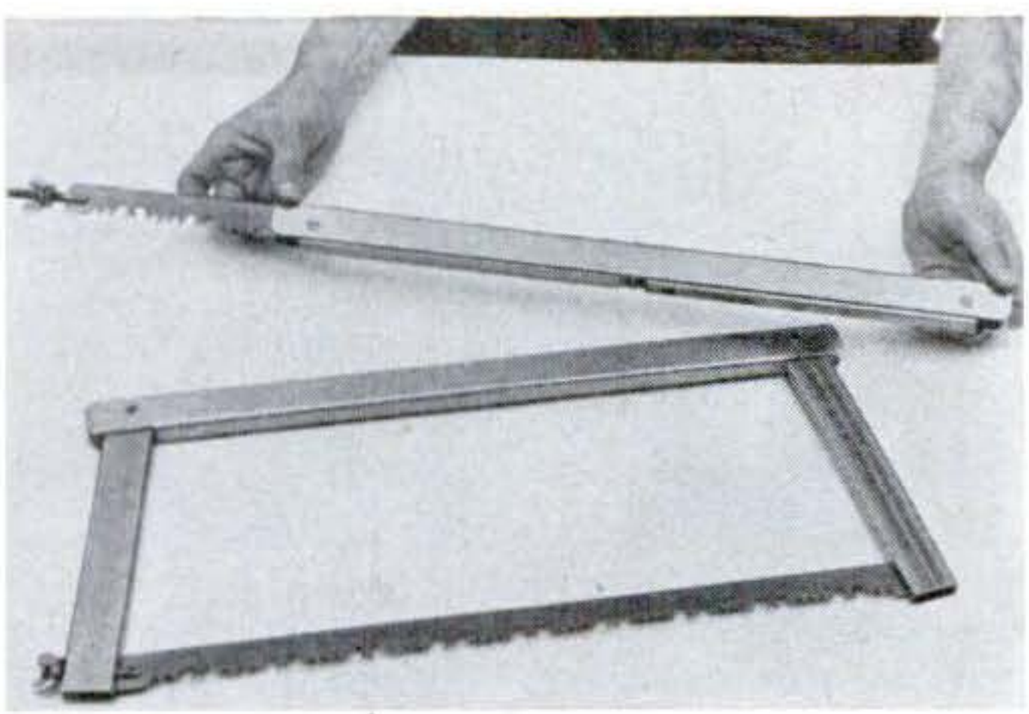
When the chair is lifted off its tablelike base, the unit is turned into a table-and-chair set for an older child. Tabletop is plastic veneer.

High Chair Fills Many Jobs

THIS new high chair takes care of many of the activities of small fry. When the chair is unclamped from its tablelike base and set down beside it, the unit becomes a table-and-chair set for big brother. By itself, the chair serves as an auto seat for Junior. And when slipped into a special wheel frame, it becomes the seat in a stroller. Weighing 45 lb., Quintot is made of tubular steel, and has plastic upholstery. The unit collapses into a package that can be stored in a closet or car trunk. It is priced at about $44 by the Juvenile Furniture Guild, of Newark, N. J.

Inserted into a carriage base of chromium-plated steel tubing, the chair becomes a reversible seat in a stroller. A canopy, as well as mother's market basket, can be attached.

Saw for Campers Folds like Jackknife



OUTDOORSMAN Charles Peters found it a chore to chop big logs into firewood with an ax when on camping trips, so he invented a 2½-lb. folding saw to do the job. To use the saw you pull out its retractable blade from the folded frame, as at top left, unfold the frame like a jackknife, and slip the blade into notches at the frame ends. Tightening a wing nut puts the proper tension on the blade. Available from Peters Enterprises, of Staten Island, N. Y., the folding saw comes in two sizes for cutting 8- and 10-inch logs. It is priced at about $6.

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New Boxcar Gives Freight "Pullman" Ride

By Sheldon M. Gallager

PS photos by W. W. Morris

FRAGILE freight gets a Pullman-style ride in this new high-speed, smooth-riding boxcar. Designed to eliminate damage to cargoes in transit—which every year costs railroads more than $100,000,000—the new "Damage-Free" car is equipped with a special load-bracing device.

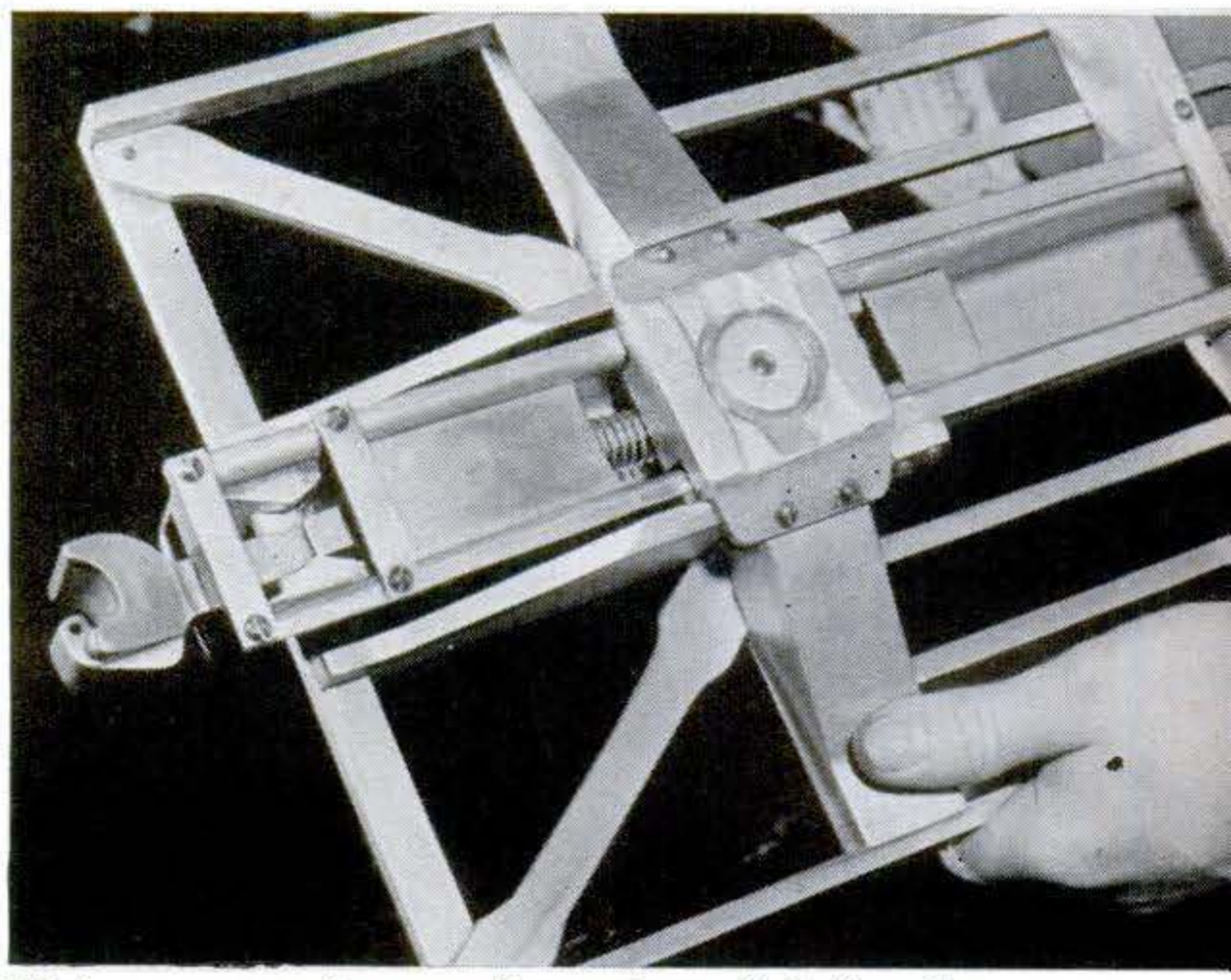
This is a system of crossbars that lock into rails in the walls, pinning the cargo firmly in place and permitting full use of the car without loss of space. It also eliminates the need for dunnage—the wood, rope, and steel straps usually used to secure cargoes—which averages $46.50 a carload.

Special wheel trucks, designed by Chrysler, enable the new car to travel at passenger-train speeds up to 90 m.p.h. without damaging the cargo. Instead of resting on top of the wheels, the car body is suspended between them on U-shaped hangers. This allows the trucks to move from side to side, like pendulums, absorbing lateral shocks, while the car body remains stationary. Because a pendulum always swings at the same rate regardless of its weight, the action of the trucks is just the same for an empty car as a full one. By simply jacking up one end of the car, two men can replace a worn set of wheels in about 15 minutes—nearly as fast as you can change a tire on your car.

Built by the General American-Evans Co., of Detroit, the 50-foot, all-steel car, called the GAEX-DF, is 10 feet longer than ordinary boxcars. Extra-wide, eight-foot doors give easy access for large, mechanized loading devices. The greater length and tighter packing enable the car to carry a 50-percent larger payload. And because of its increased speed, the car can average 100 miles a day, compared to 41 for ordinary cars.

What will all this mean to the railroads? The difference, perhaps, between profit and loss, say the car's designers. The company plans to create a pool of the cars and lease them to the railroads as they are needed. A hundred are already on order, and if enough are put into use, the company believes that railroad earnings, which average 3.6 percent, may be boosted to 6 percent.

Move over, passengers, and make room for some fast freight!



Unique center beam, shown in model of underframe above, runs full length of car. Held to frame by springs, it slides in and out to absorb shocks of coupling and sudden starts and stops.

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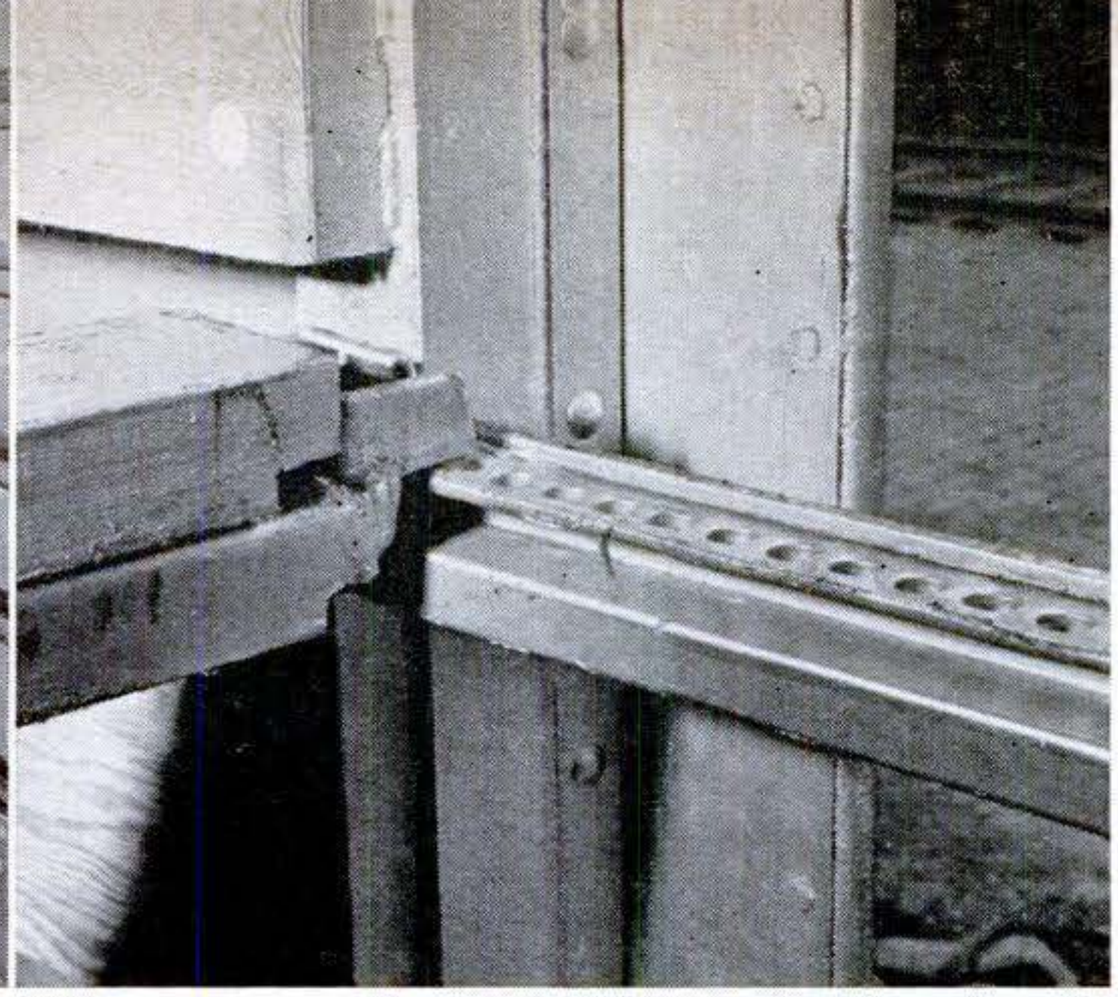
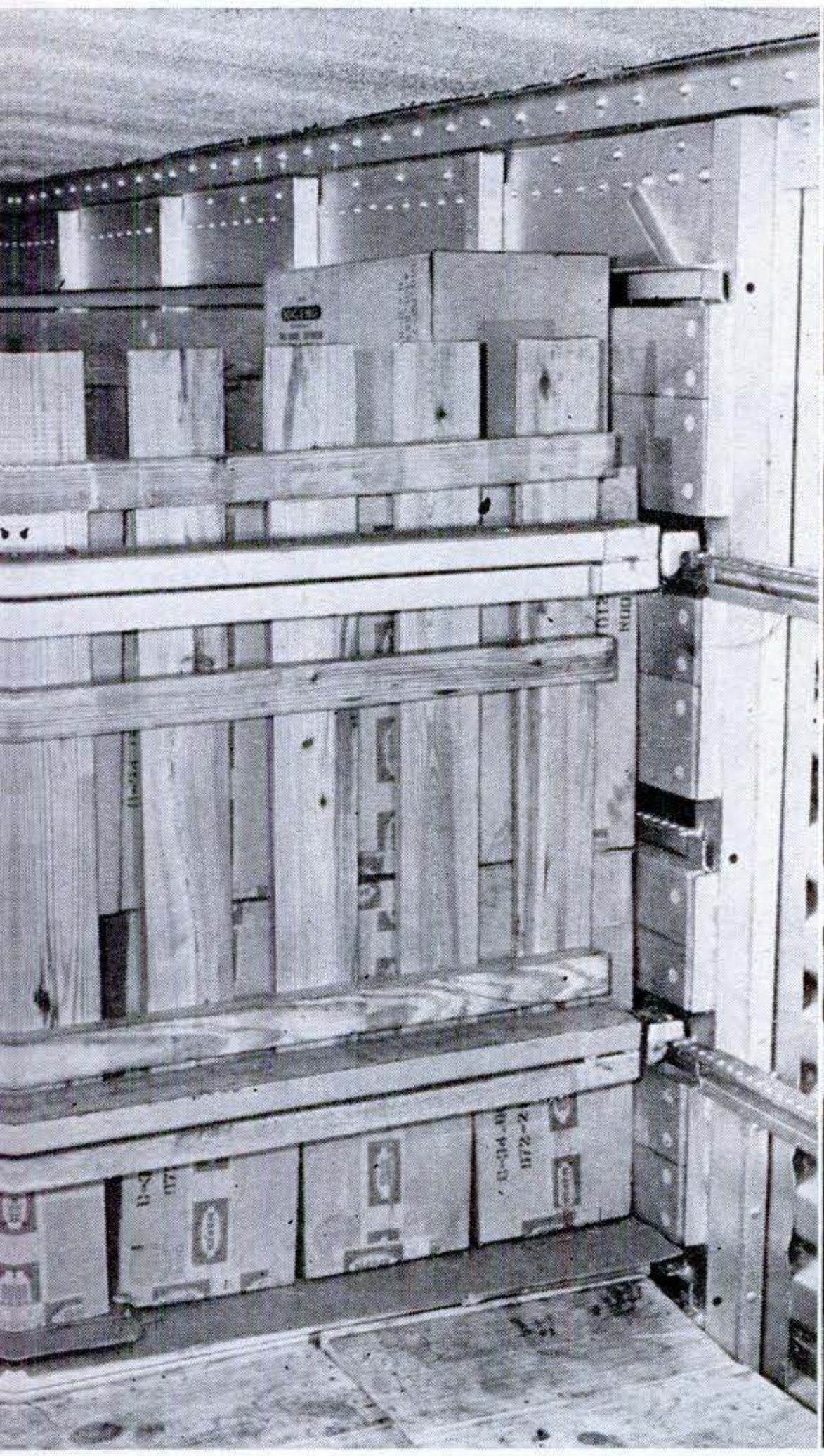
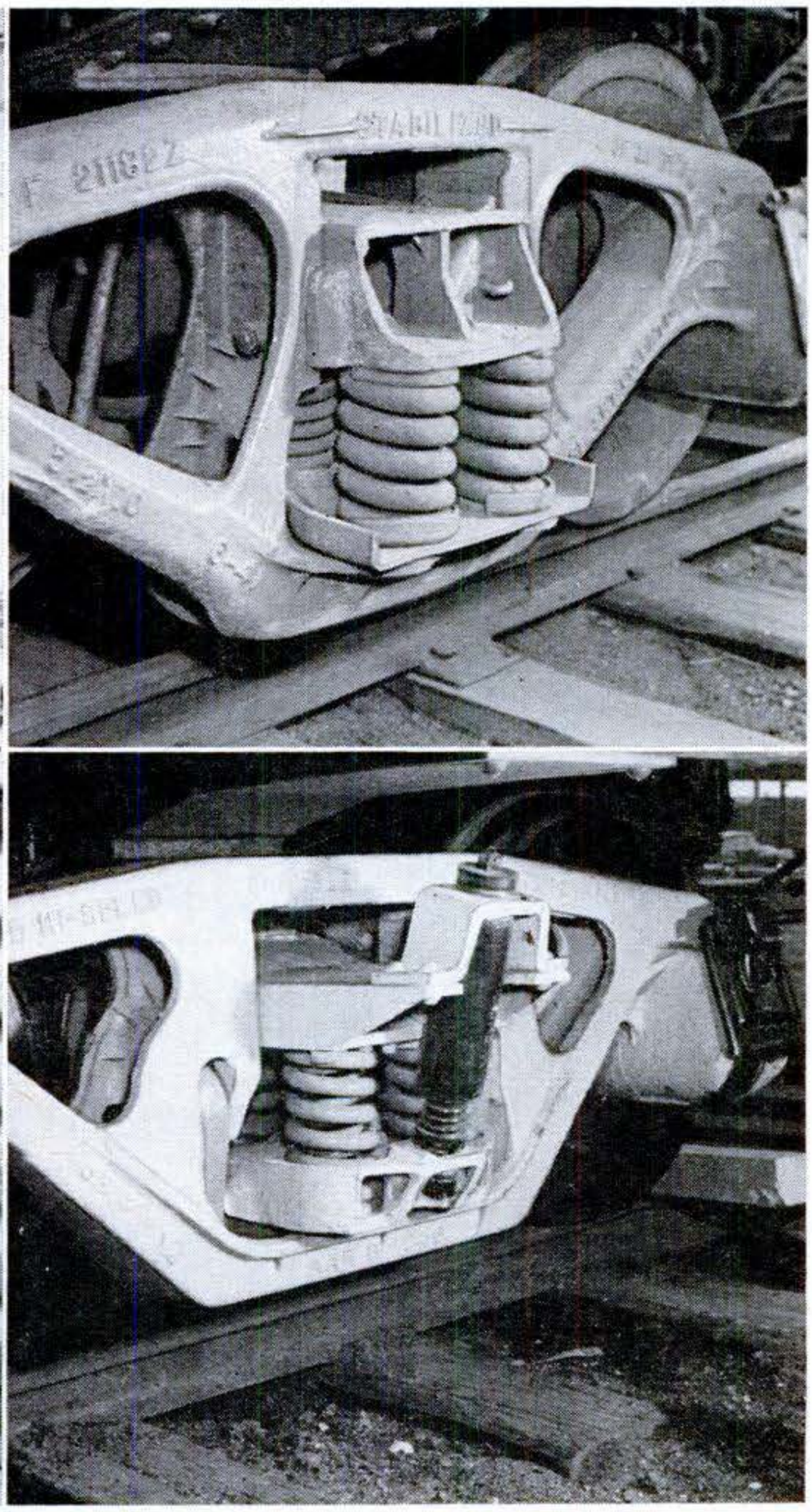
Crossbars are supported by steel rails, spaced about a foot apart, that run full length of car's walls. Note how wooden deck, laid over bars, can be used to make platform at any level.



Prongs on each end of crossbar lock into holes in wall rails, holding crossbar fast at any point. Wall rails run across doors to permit full loading of car, but are removable for access.



Partly loaded car shows how crossbars pin cargo firmly in place. Note how a wooden deck, laid over crossbars in photo at top to make platform, is here used upright to form bulkhead.



Conventional truck (top) moves only vertically. New one (bottom) moves sideways as well to absorb lateral shocks. Cylinder in foreground is snubber to damp springs, stop bounce.

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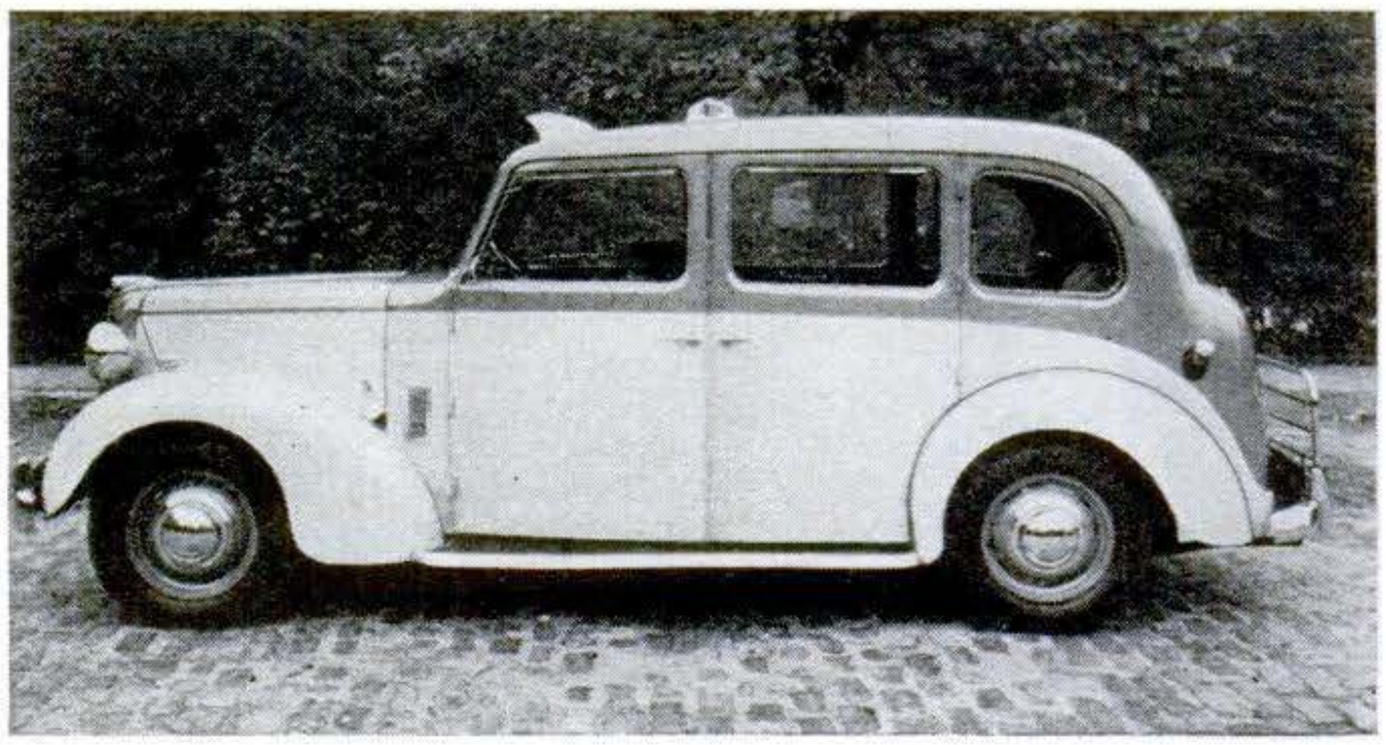
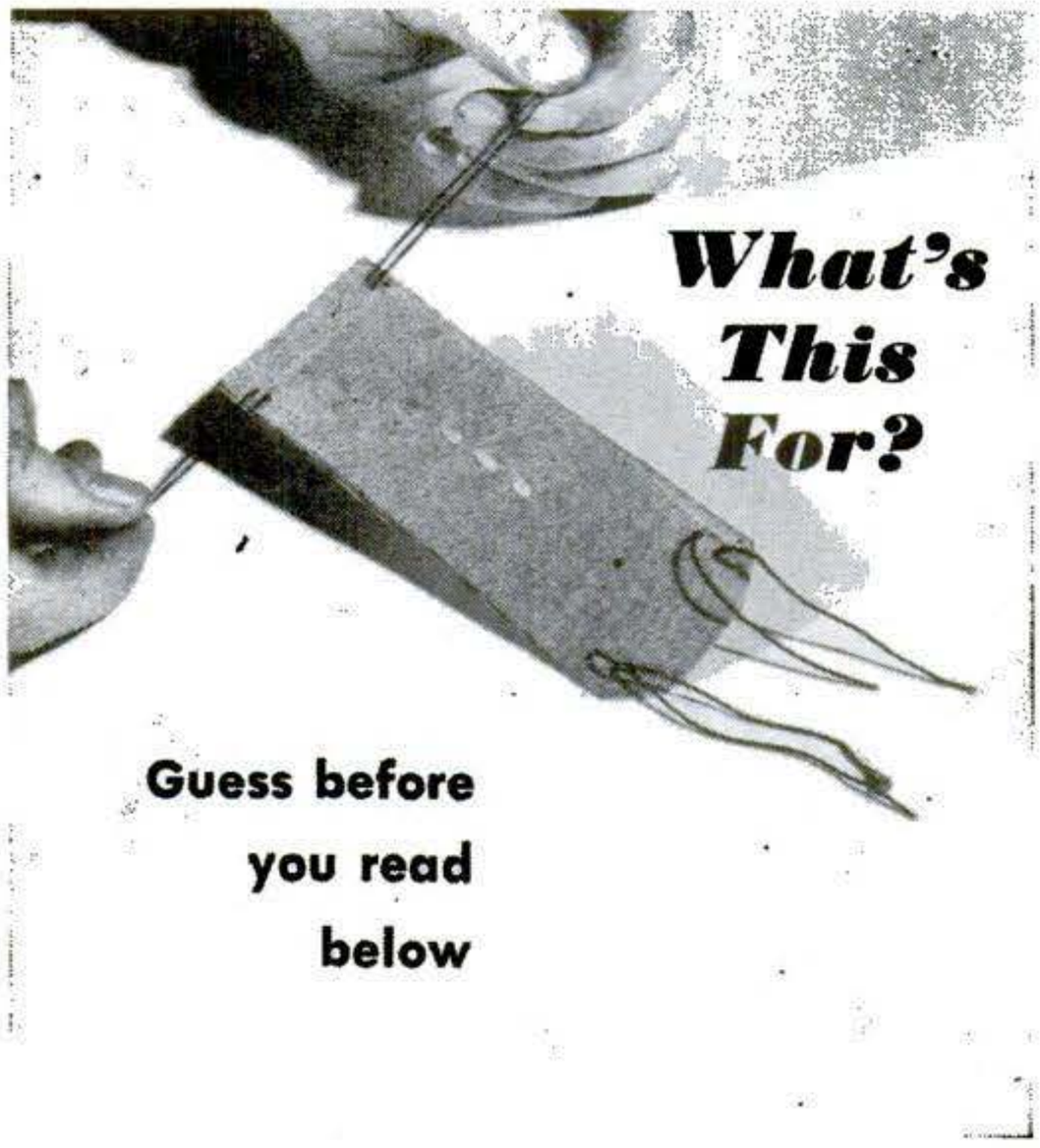
Baby 'Dozer Does Big Jobs

THIS baby bulldozer can do most of the things its big brothers can do but on a smaller scale. It's intended for use by builders, landscapers, and gardeners. For digging, filling, and hauling, its hydraulically operated dump bucket can lift up to 500 lb. and hold 4½ cu. ft. For grading, a 'dozer blade can replace the bucket. For snow removal, a plow can be attached. Powered by a single-cylinder, 5-hp. gas engine, the 'dozer is only 3 feet wide and 5 feet long, yet has an 800-lb. drawbar pull. Made by Mead Specialties, of Chicago, it sells, with bucket lift, for about $975.

Cab Cuts Traffic

DESIGNED to lessen traffic congestion, this small Austin taxicab has just been approved for use in New York's crowded streets. About four feet shorter than conventional cabs, it seats five passengers and turns in a 26-foot circle. Its 70-hp. engine averages 14 miles to the gallon, compared to 8 for other cabs.

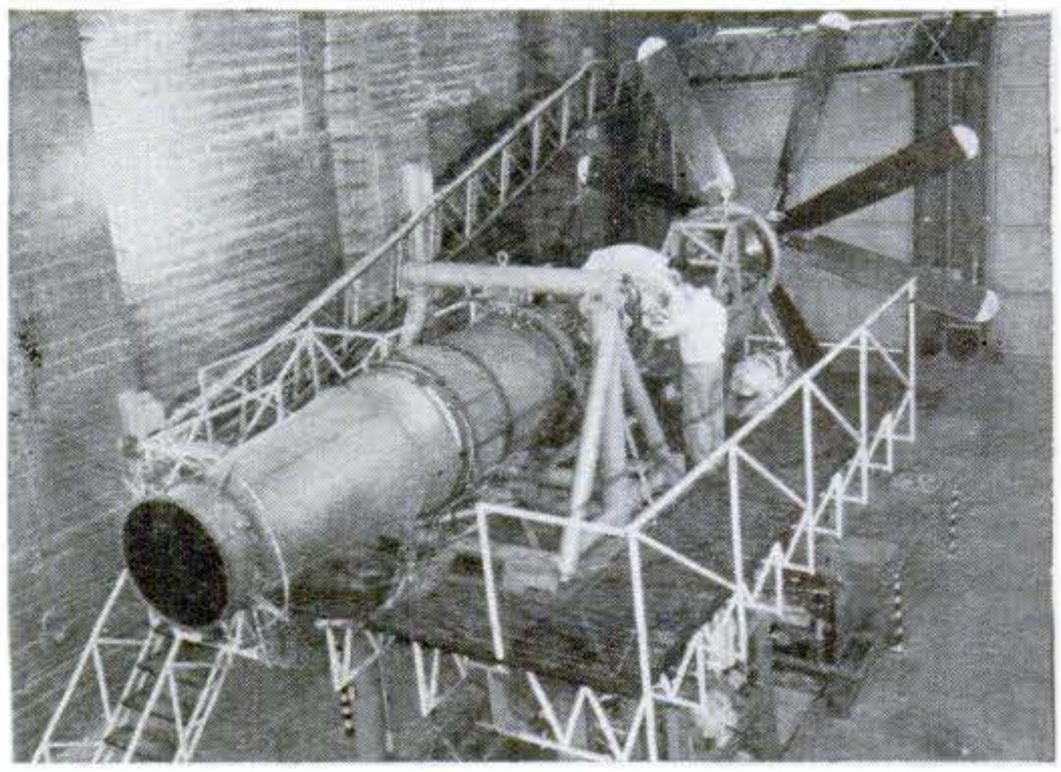




It's a fly swatter for cows. A leather pouch containing absorbent material inside, it's saturated with fly ointment and then tied to the animal's tail. When Bossie swishes her tail, she spreads the insecticide over her body, killing the flies. Its name is Humane Fly Pad.

World's Mightiest Turboprop

Most powerful aircraft engine of its type, a new Air Force turboprop power plant has delivered more than 10,000 hp. during tests. Still experimental, the XT-37 Turbodyne is shown below in its test bed fitted to a 16-ft. contrarotating propeller. Built by the Turbodyne Corp., Hawthorne, Calif., it is the first of its kind designed for tractor or pusher use without modification.



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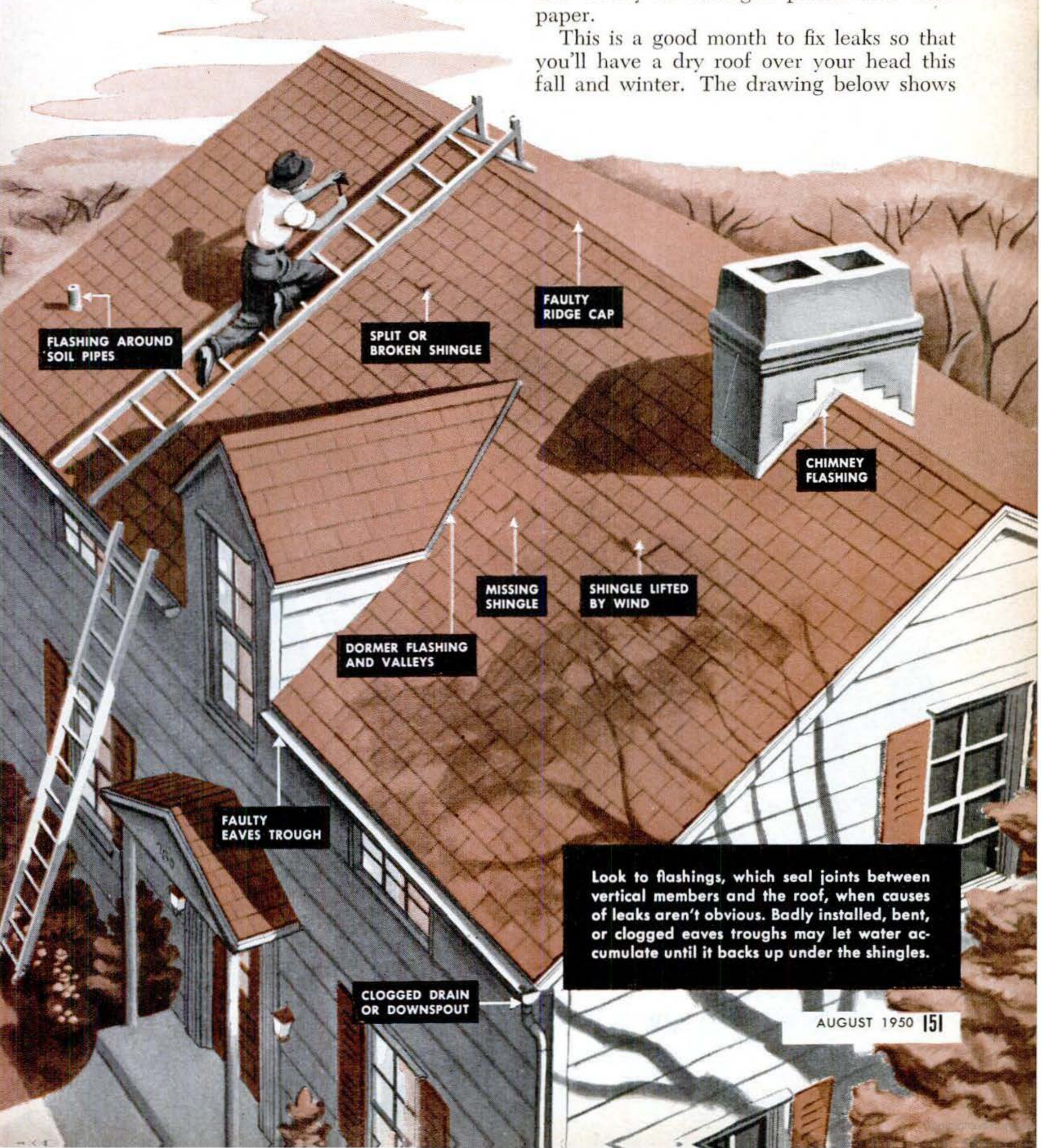
Fix Your Roof Yourself

By George H. Waltz, Jr.

Now's the time to spot those leaks and prepare your house against fall rains.

RAIN on the roof has a cozy sound only while it stays out. When it's plunking into a bucket set under a leak, it's yelling for roof repairs. Those drips can cost you real money in damaged plaster and wallpaper.

This is a good month to fix leaks so that you'll have a dry roof over your head this fall and winter. The drawing below shows



Look to flashings, which seal joints between vertical members and the roof, when causes of leaks aren't obvious. Badly installed, bent, or clogged eaves troughs may let water accumulate until it backs up under the shingles.

nine common causes of leaks. Next time you have to hunt up a bucket, grab a handful of wire scraps, long nails, hairpins too, and head for the attic.

If yours is an open, unfinished attic, some leaks may show as water spots and drips. The tip-off may be as obvious as a glint of daylight through the shingles. More often it takes a bit of detective work to trace a trickle back to the hole it started from. Water can run a long way down the rafters before hopping off or soaking into a wall or floor.

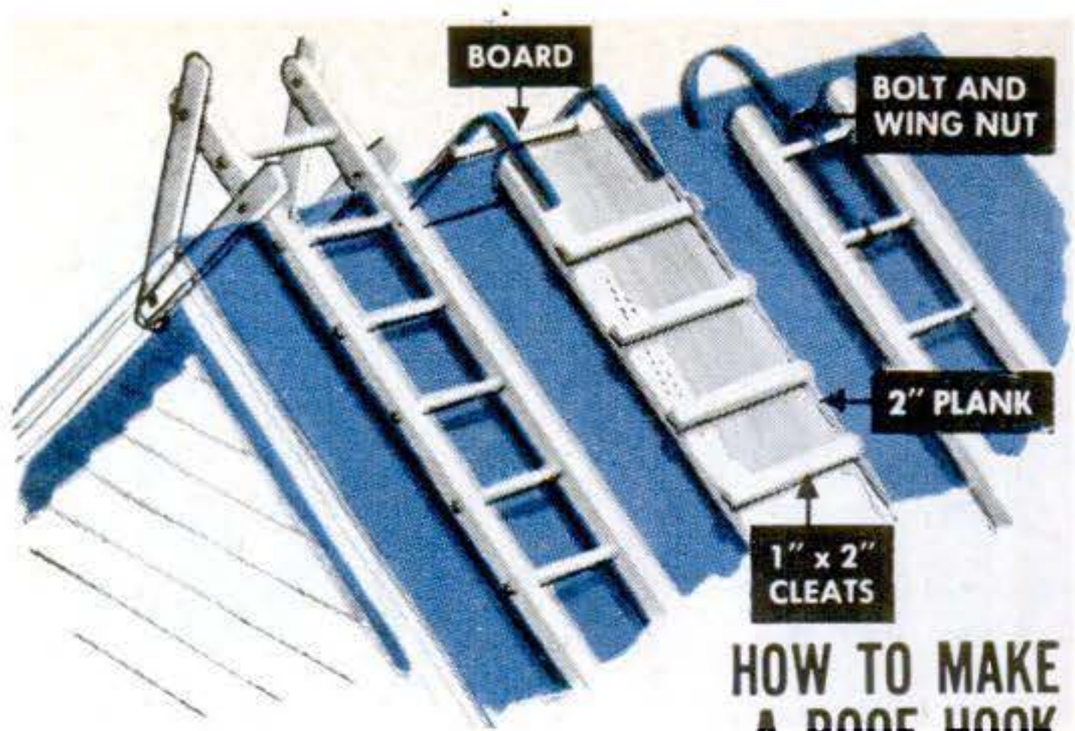
When you find the villain of the piece, poke a bit of wire, a nail, or a straightened hairpin through to locate the leak on the outside of the roof.

Shingles Can Be Troublemakers

If you have a finished attic, or one you can't enter, you can only localize the leak roughly. Then you'll have to find it from on top of the roof, remembering that water runs downhill but can change course sharply at valleys—those angles formed by two roof slopes, or by the roof and a dormer.

If you have a wood-shingle roof, you will probably find that most of the leaks you've marked are caused by split, warped, or loose shingles. In any case, you won't find the repair too difficult if you equip yourself with the proper tools.

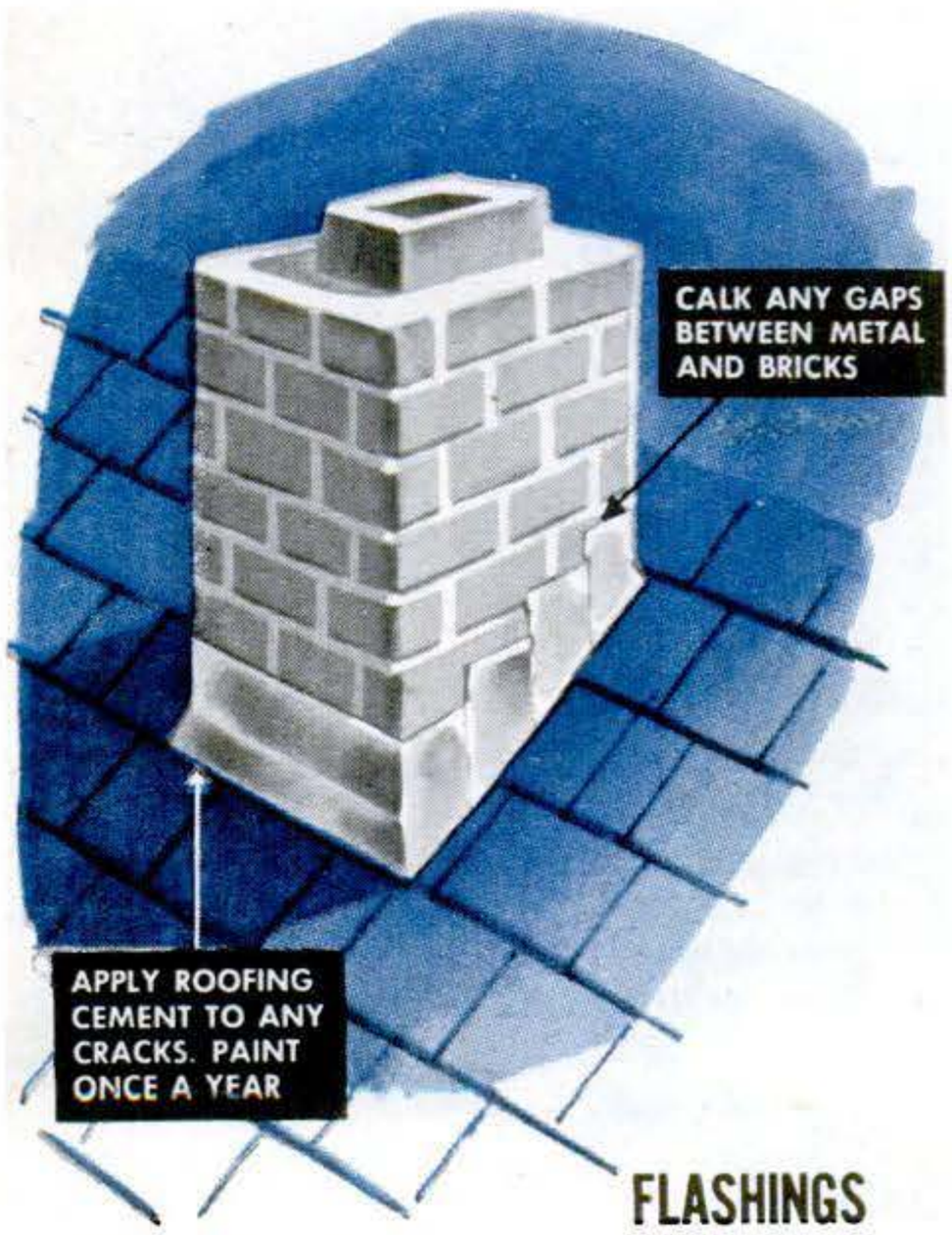
First on the list should be a pair of rubber-soled shoes—preferably sneakers. They will give you a safer footing and will also protect the surface of the roof. Hard-soled shoes are not only slippery but may damage the shingles.



HOW TO MAKE A ROOF HOOK

Next, you'll need a roof hook to help you clamber up and down the slope of the roof. This can be a ladder with a forged hook or a wooden one, as shown in the drawing, or a 2-in. plank fitted with cleats and a pair of improvised hooks to fit the peak. If possible, the ladder or plank should be as long as the roof's slope. Then, by moving the hook where you want it, you can reach any point on the roof quite safely.

You'll also need a hammer, a small hatchet, a chisel, a metal-cutting saw or a roofer's ripper (a special hooked cutter used to cut off the tops of old shingle nails), tin snips, some galvanized tin or sheet copper, a can of roofing cement, a can of roof paint, shingle nails, and, of course, some spare shingles.



FLASHINGS

VALLEYS

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First check the metal flashings around the chimney, soil pipes or other vents, and where any slope of the roof meets a vertical surface. "Hard-to-locate" leaks generally can be traced to faulty flashing. Fill any cracks or open joints with roofing cement and then coat the entire flashing with good roof paint.

If you find a leak in a metal valley—the drainway where two roof slopes come together at an angle—coat the spot with roofing cement and cover it with a piece of galvanized tin or copper. Make the patch of the same metal as the valley. Bend it to fit and fasten it in place with zinc-coated roofing nails. Coat the patch, particularly the edges and nail heads, with more roofing cement and paint with roofing paint. This same technique can be used to patch tin decks over porches and the like.

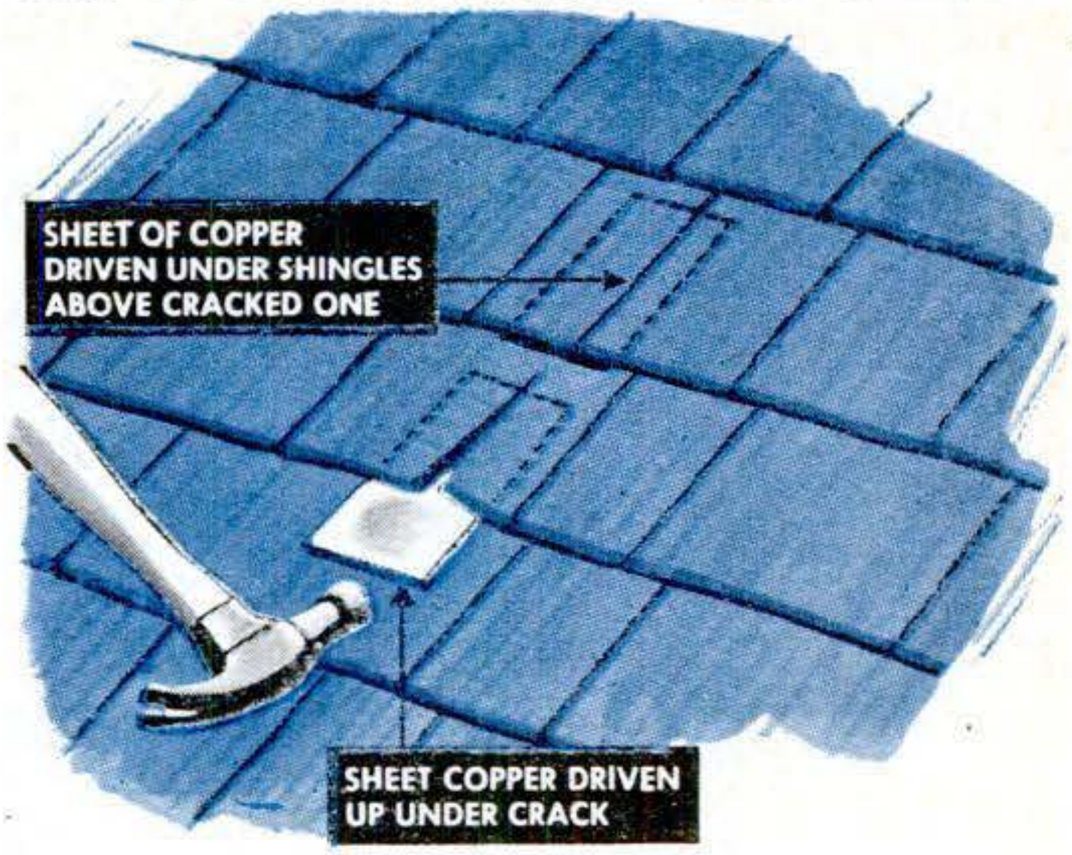
Two Ways to Fix Wood Shingle

If your general inspection uncovers a cracked wood shingle, it can be repaired in either of two ways. If it is not too badly cracked, two 3″ by 8″ strips of galvanized tin or copper generally will do the trick. Drive one sheet up under the split shingle until its lower edge is flush with the edge of the shingle, and drive the second up under the shingle directly above so as to cover the hidden part of the crack. To get the sheets started, you may have to pry the lower edges of the shingles up a bit with a chisel. But don't pry any more than you have to.

A shingle that is badly cracked and warped should be removed and replaced. To do this, carefully split the shingle into small bits with a hatchet or a chisel and remove the pieces. Then, using a metal-cutting saw, or a hacksaw blade fitted with some sort of handle that will allow you to work up under the shingles immediately above, cut off the tops of the two old shingle nails.

You may want to dip the new shingle in preservative, or otherwise color it to match the rest of the roof, so that it won't be conspicuous. After the new shingle has been slipped into place, fasten it by driving an ordinary nail down through the space between the two adjoining shingles above it. Remember that the joints between shingles shouldn't be aligned within three courses; even if aligned joints are a course apart, the splitting of the shingle between could create a leak. Finally, to prevent any possibility of rain leaking through the nail hole, drive a

HOW TO REPAIR A CRACKED WOOD SHINGLE



STEPS IN REPLACING A WOOD SHINGLE

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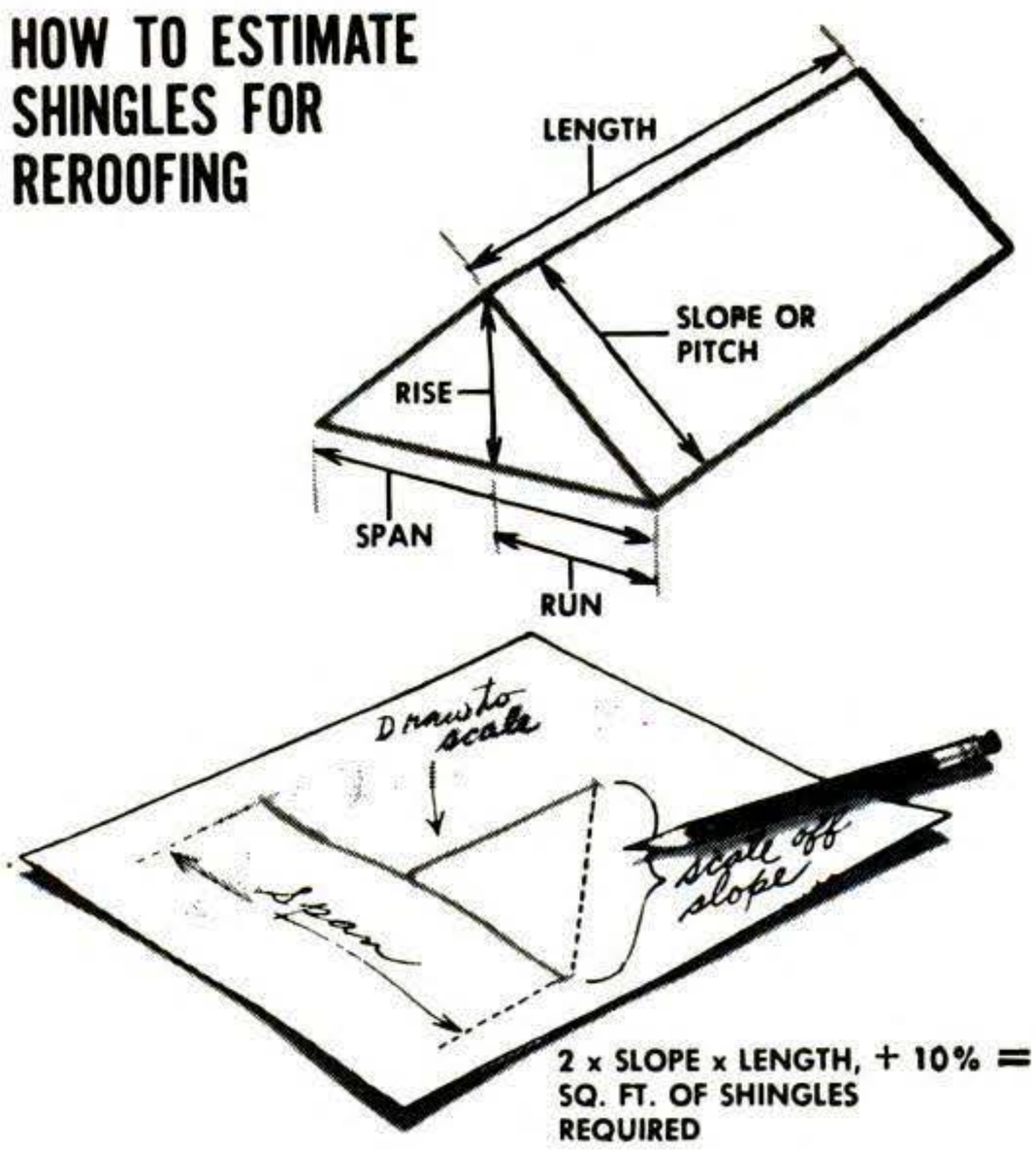
HOW TO ESTIMATE SHINGLES FOR REROOFING



strip of tin or copper up under the shingle above to cover the nail head.

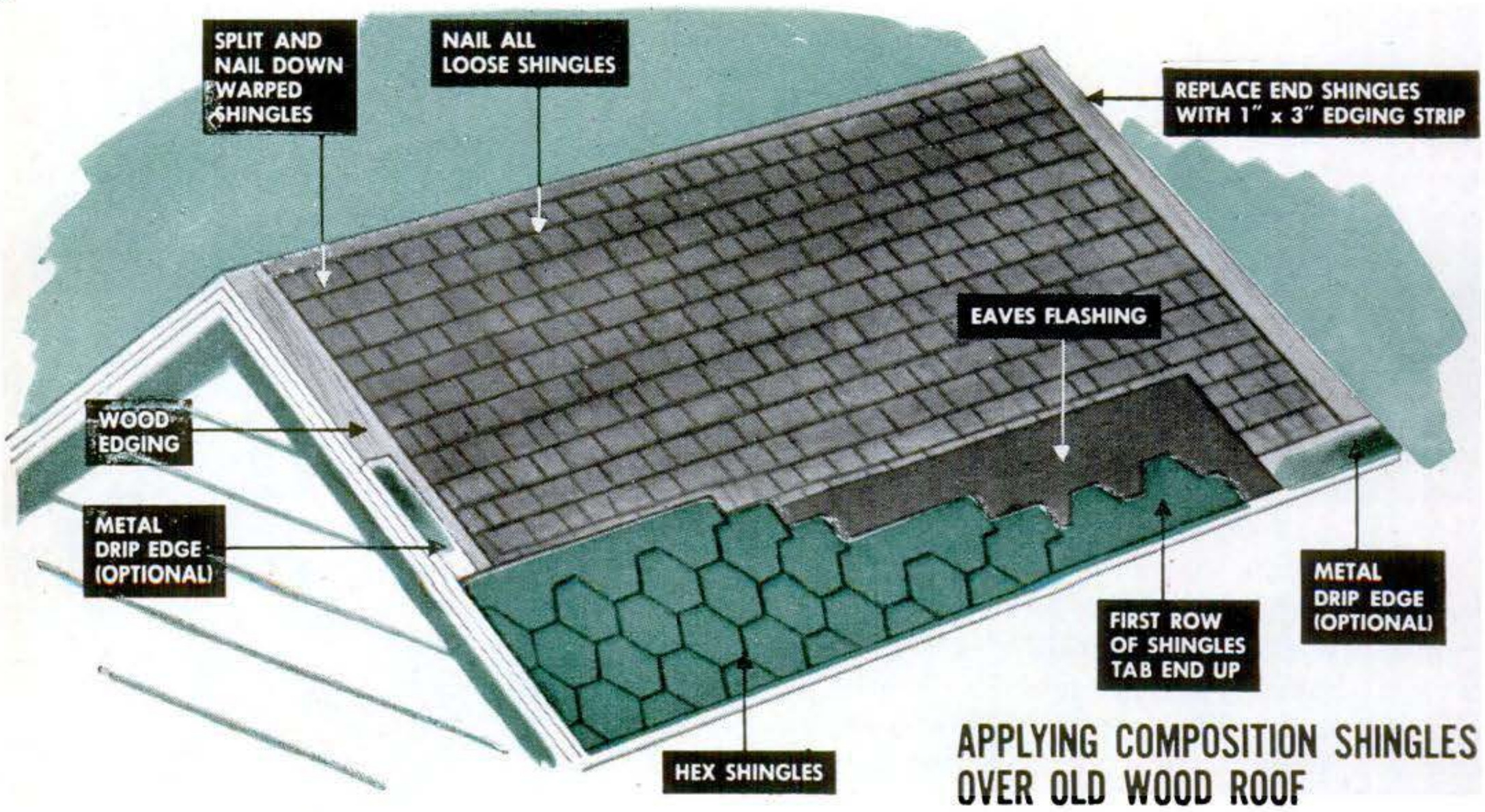
Repairs to a damaged shingle on a composition roof can be made in much the same way. Single asbestos-cement shingles can be replaced just like wooden ones. Asphalt shingles, however, are usually in the form of two- or three-tab shingle strips. With these, the entire strip containing the damaged shingle will have to be removed and replaced.

If you've decided that it's about time you replaced your old wood shingle roof with a composition roof, your first chore will be to figure out just how much roofing material you will need. That means you will have to know the roof's length and its pitch or slope (distance from peak or ridge to eaves). The length is easy to estimate by measuring your attic floor. The slope, however, is hard to get at with a rule. One way is to measure the rise (the height) and the span (the width) in your attic and then make a scale drawing on which you can measure the slope to scale with fair accuracy. Multiply the slope by the length, double it for a simple gabled roof, and you have the total roof area. No matter what figure you arrive at, add about 10 percent to be on the safe side.

Buy by the Square

In buying shingles, you will find that they are sold in "squares." A square is the amount of roofing needed to cover 100 sq. ft. of roof area. Since the type and design of shingle varies, the number of bundles to a square also varies.

In most cases, if your old wood-shingle roof is not too badly deteriorated, composition shingles can be applied right over the old roof, but it first should be properly prepared. Loose nails should be replaced, protruding nails should be driven home, loose shingles should be nailed, warped shingles should be split so they will lie flat and should be nailed, and missing shingles should be replaced. Both the appearance and durability of your new roof will depend to a great extent on how well the old roof surface is put in shape. END



APPLYING COMPOSITION SHINGLES OVER OLD WOOD ROOF

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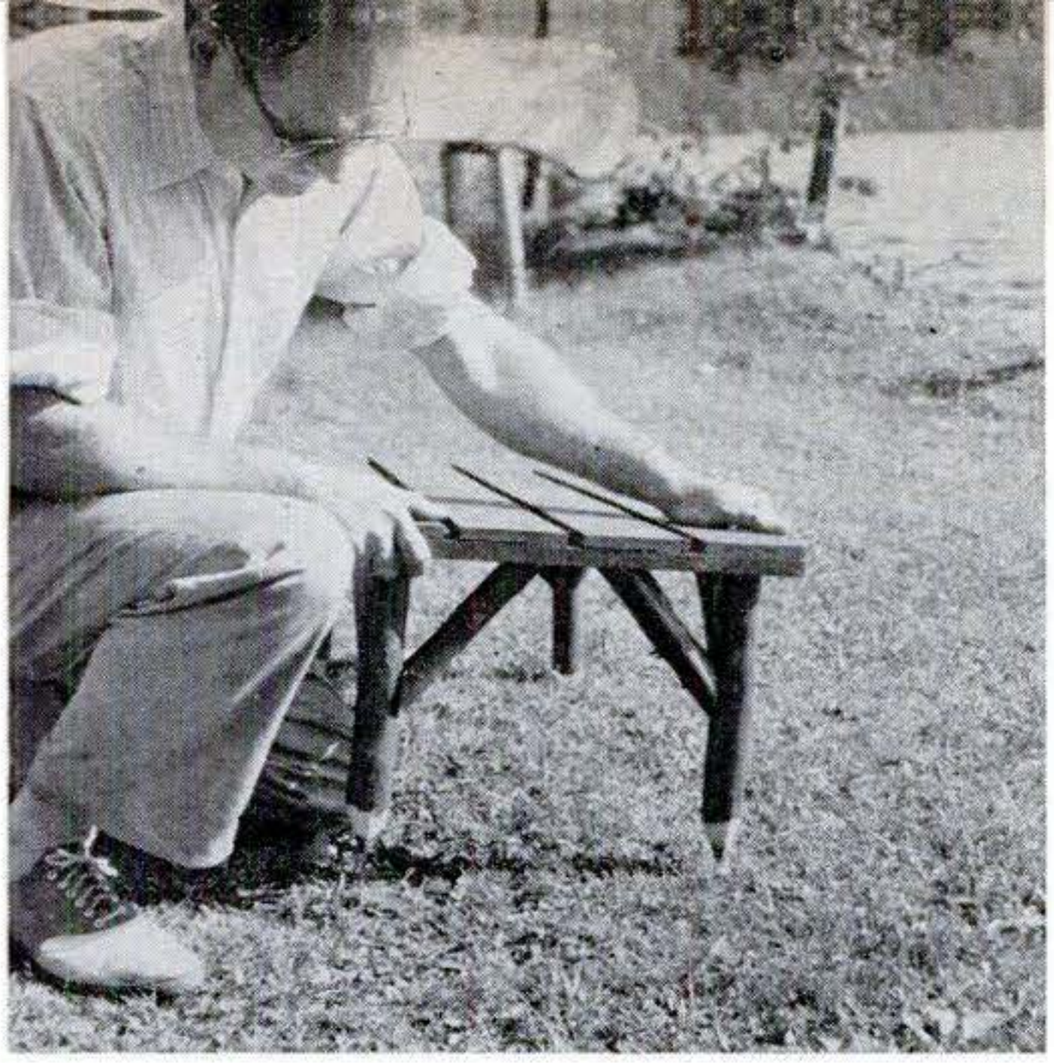


Tables From Floor Boards

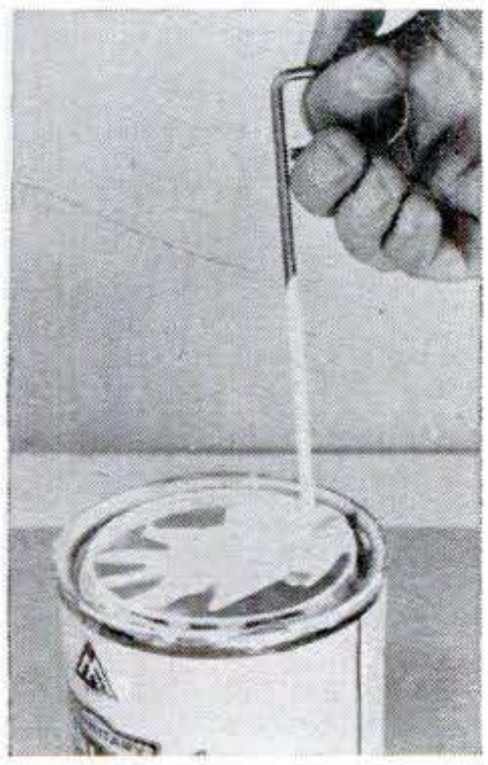
WE NEEDED a lawn table near our fireplace. A set of unused rowboat floor boards caught my eye, and an hour later we had the very handy table you see above. I cut the legs and braces from slim cedar poles.

Furniture used on an uneven lawn often acts like a seesaw. I fixed that by trimming each leg with an ax to a moderately tapering point. Now when the table is moved, we need only press on it. It seats itself solidly and doesn't teeter.—*Hubert V. Coryell, Pasadena, Calif.*

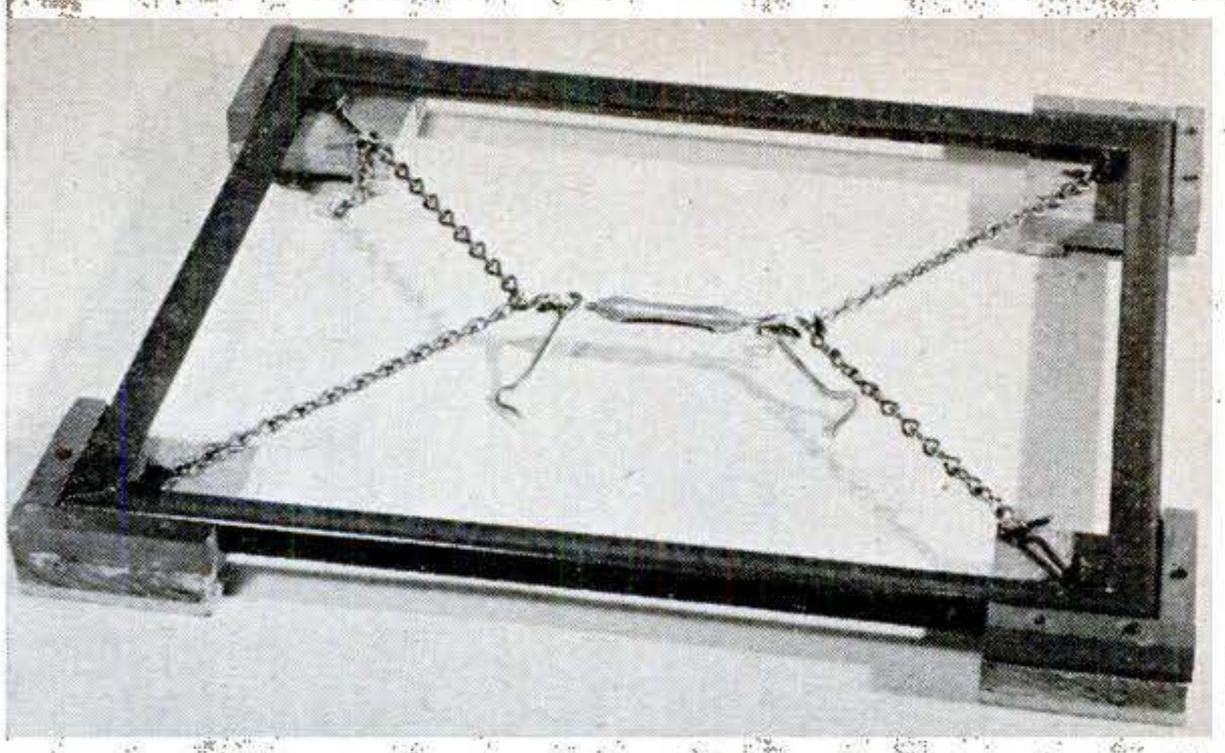
Sanding Dust Fills Holes

I ALWAYS save the sanding dust when I build or repair furniture. It comes in handy for filling small brad holes or cracks. After sanding any fine hardwood, I collect the dust and store it in a labeled jar. To make wood filler I mix two parts of dust to one part of powdered phenolic-resin glue, then add water carefully. The filler matches the wood on which its used and is almost indistinguishable.—*J. B. Leeth, Cullman, Ala.*

Mixing Tool Swirls Paint



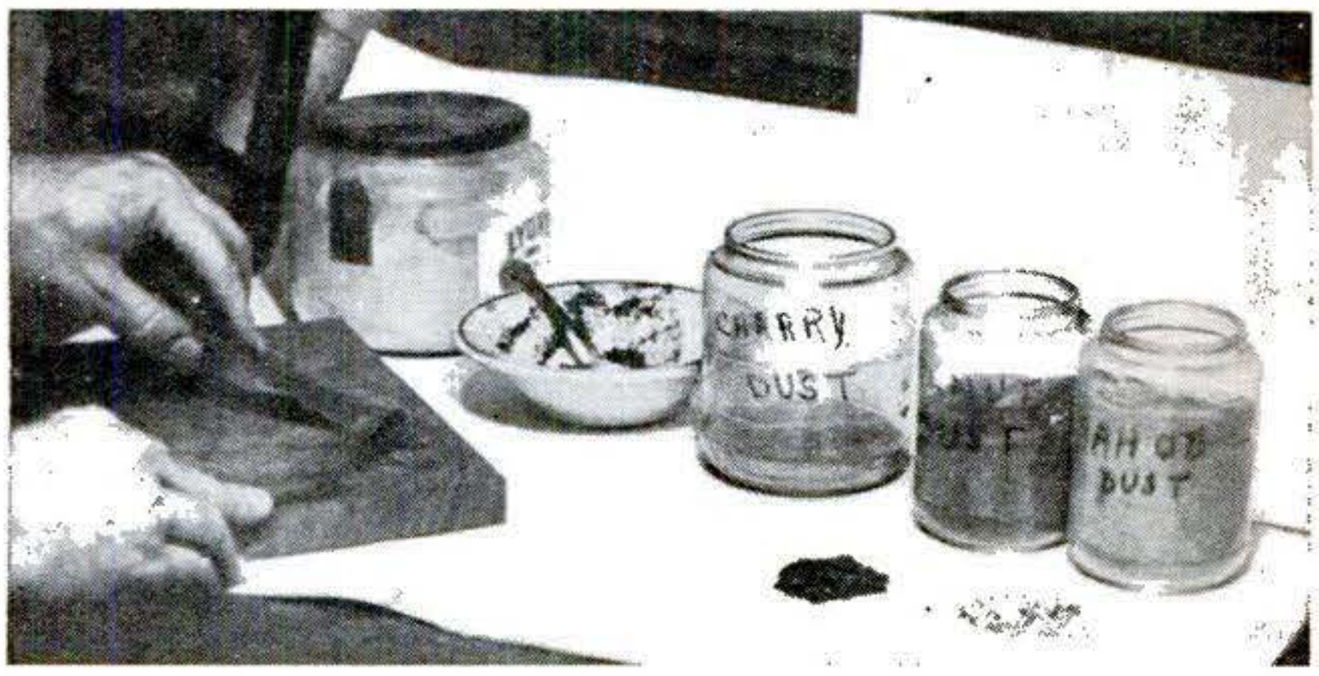
FAN-SHAPED blades on the new paint stirrer at left agitate the paint when you move the handle up and down. The Rotoswirl is made by Elmhurst Specialties, Peoria, Ill. A set of two handles and three blades—to fit pint, quart, and gallon paint cans—sells for $1.50.



Frame Clamp Is Adjustable

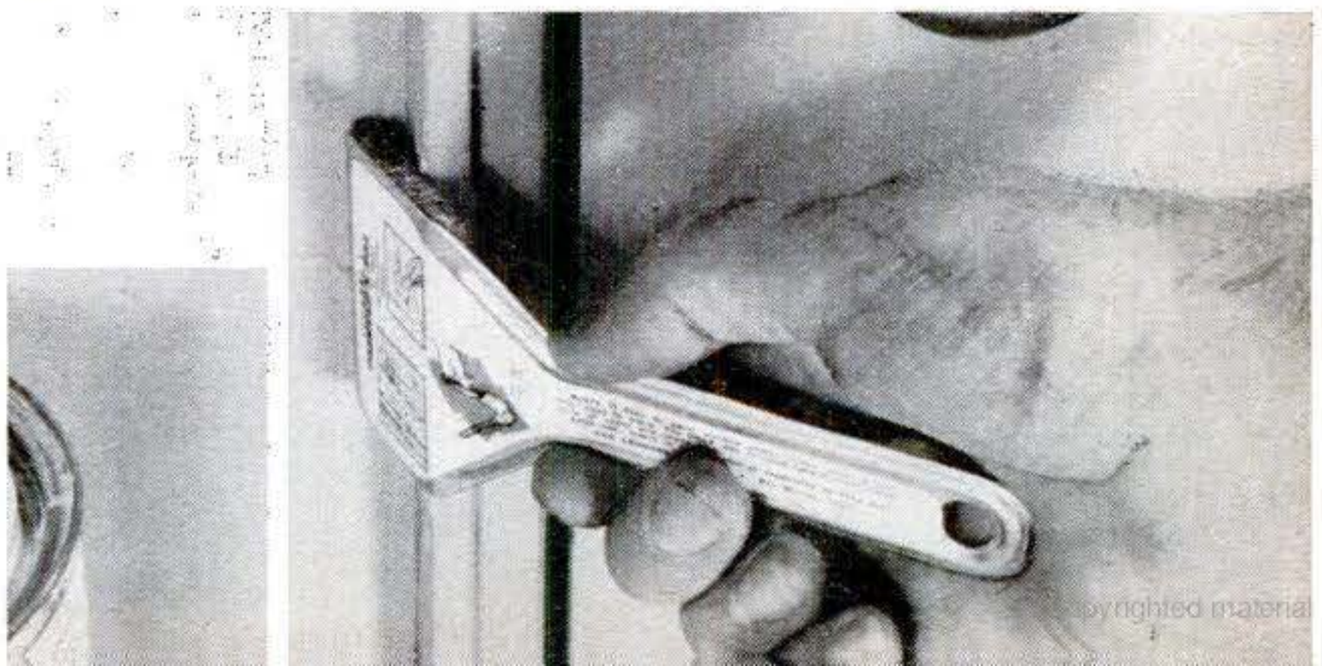
WITH about 50 cents and a few minutes work, you can solve one of the most annoying problems in woodworking: how to clamp a mitered-corner picture frame until the glue sets. Cut four hardwood blocks and screw two strips of wood to each block in the shape of a right angle. Now obtain two lengths of chain and bolt one end of each chain to one of the blocks. Attach door hooks to the other two blocks.

In use, the chains are hooked to the blocks and joined at the center by a turnbuckle and S-hooks. You can attach long hooks to the buckle to accommodate long frames.—*C. A. Veburg, Omaha, Nebr.*



Pad Paints Wood Trim Faster

THIS 25-cent tool makes it easier to paint door and window frames and other trim. It's called the Painter's Pal, and consists of a woolen applicator pad cemented to an aluminum handle. The Leonard Company, Des Moines, Iowa, manufactures it.



Under-Sink Cabinet Adds Storage Space

An old fixture modernized will make any housewife's daily work easier.

By Harold Jackson

WHEN we remodeled our kitchen, one of the first fixtures to go down to the basement was the old sink. Instead of selling it to the junkman or piling it in a corner, I installed it in the basement where I built this cabinet for it.

Even if you get a new sink for the kitchen, boxing the old one in with a cabinet will make it much more useful and attractive. Cleaning materials, brushes, and buckets can be kept out of sight behind doors.

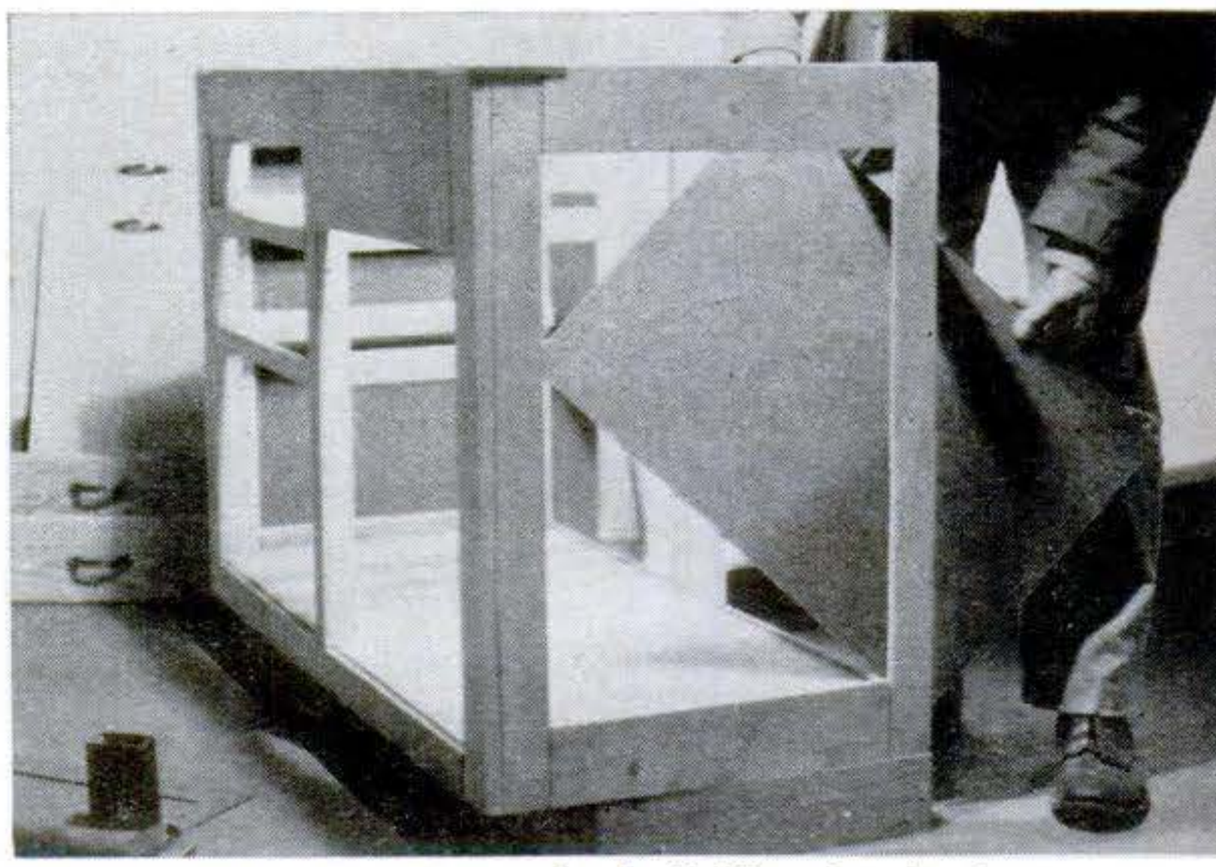
In our basement, the old sink takes care of dirty jobs that would muss up the kitchen or bathroom. It comes in handy at canning time when there's lots of fruit and vegetables to be prepared. And when the kids come in from play, they wash up in the basement where a little splashing doesn't matter. I use it, too, after a session in my workshop. If you decide to put an extra sink in the basement, you can usually pick one up for a few dollars at a second-hand store.

The drawing on the opposite page gives you the dimensions I used, but measure your own sink carefully before you start to build a cabinet for it. This cabinet was built for a 20″ by 42″ sink, but you'll probably want to modify it somewhat.

All parts of the frame, except the drawer slides, are ¾″ stock. The drawer slides are 1″ by 1½″ with a ½″ by ½″ rabbet. End and back panels are 3/16″ composition board.

The base of the cabinet—also made of ¾″ boards—is 42″ long but only 16″ wide, 4″ less than the width of the upper part of the cabinet. This leaves space for your toes under the front of the cabinet. Blocks attached with screws on the inside secure the base.

Details of the drawers are shown in the drawing. The dimensions of the drawers are identical except for a 1″ difference in height.



Framework of cabinet looked like this before end panels were installed. Panels fit in rabbets and are held in place by ¼″ by ¼″ strips.

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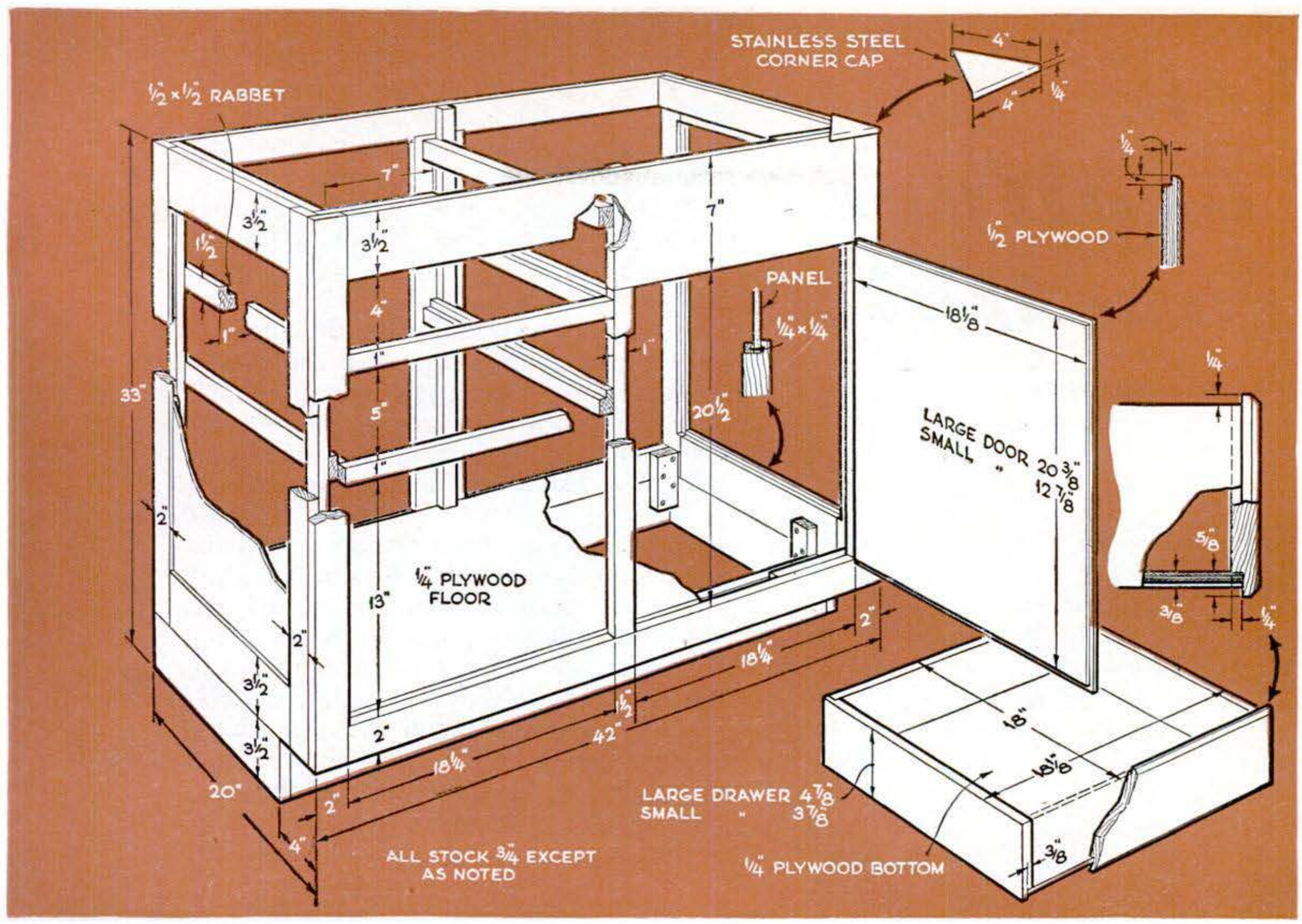
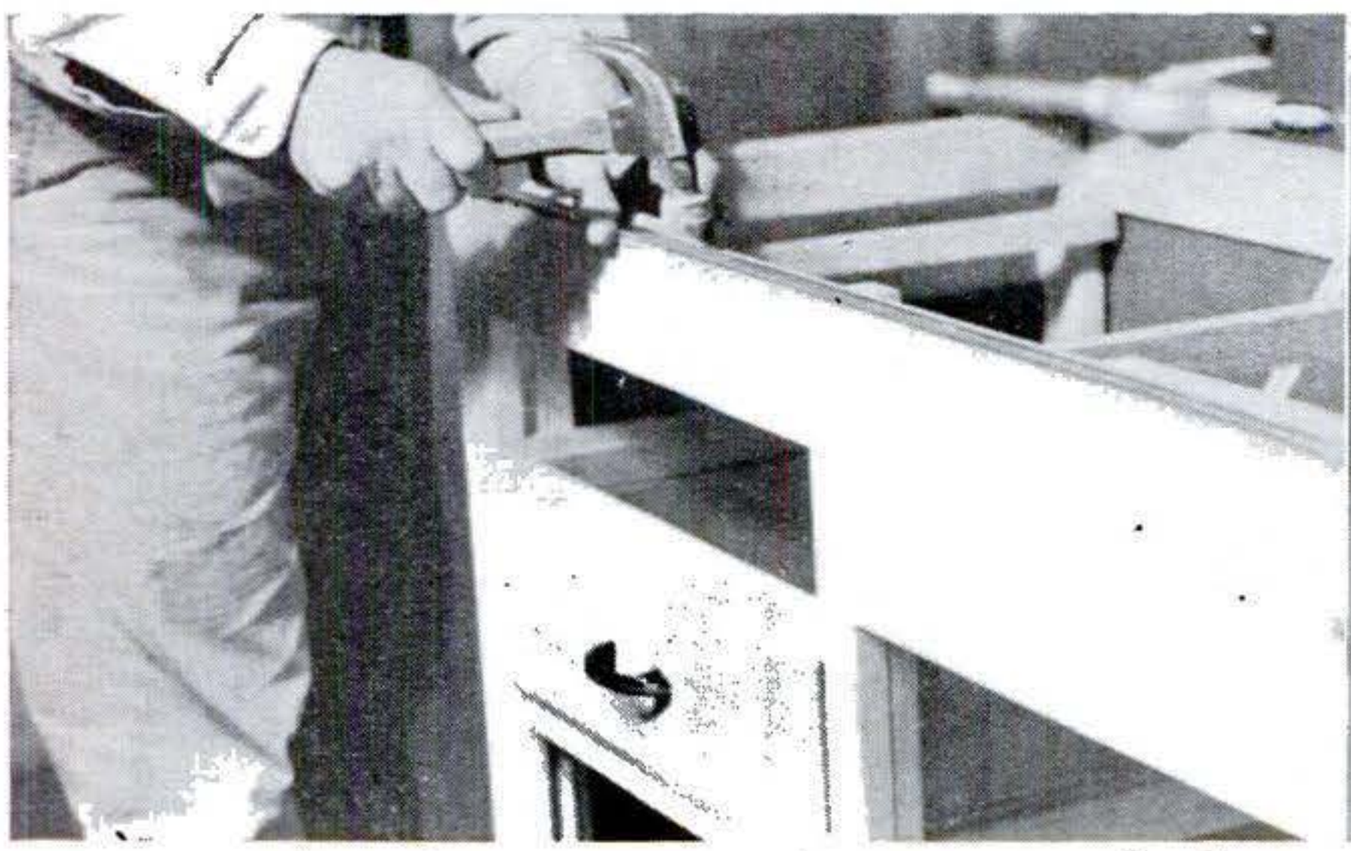


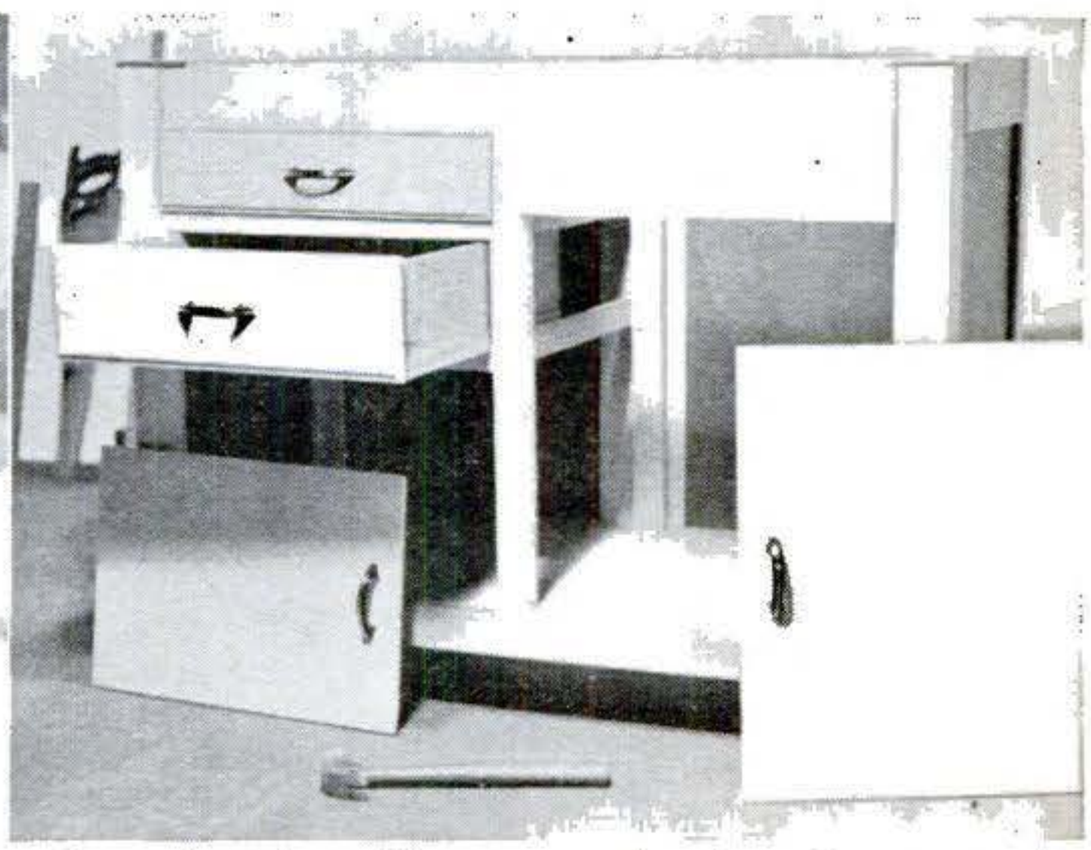
All four sides are ¾″ stock with the bottom edges rabbeted to take the ¼″ plywood bottoms. A clearance of ⅛″ is provided so the drawers will slide easily.

Both the ½″ plywood doors are 18⅛″ wide. The small door is 12⅞″ high and the other door is 20⅜″ high. The fronts of both the doors and drawers have a ¼″ overlap all around. Offset surface hinges were used on the doors. Inside snap catches hold them shut.

I bent the corner caps to shape from scraps of stainless steel, but factory-made ones can be bought. Paint or enamel the cabinet and attach the handles to doors and drawers to complete the job. END



As a decorative trim between top of cabinet and rim of sink, a strip of linoleum was tacked all along front and sides of top edge.



Completed cabinet, ready for doors to be hung, is shown above. Base was stepped back to leave 4″ of toe space under front of unit.

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New Furniture from Old

By Denis Sneigr

PS photos by W. W. Morris

YOU have probably found—if you've shopped for new furniture lately—that the good pieces bring high prices. Lots of times, from the standpoint of quality and your pocketbook, you can do better at a secondhand store.

Many older pieces of furniture are well constructed. The chief drawback often is the finish, which is usually in bad condition. That's where you and a little elbow grease come in. Shop carefully for the furniture you want. Be sure the piece is sound—that it doesn't have broken joints or splits in it.

Standing in a dusty corner of a secondhand shop, the small cabinet pictured here didn't look like much. It had been covered with a coat of varnish and then a coat of paint. On top of that coat, drops of paint of several different colors had been spilled. Closer examination, though, showed it was very well built of rosewood. The oak chest that's also shown was finished with varnish and had an ugly, old-fashioned look.

You'll find it easier to do the refinishing if you first remove all hardware—drawer pulls, hinges, knobs, locks. Otherwise, these are just obstructions to smooth sanding.

Then start removing the old finish with

The original oak chest, above, was coated with cheap varnish. Here old drawer pulls are being removed before starting refinishing operations. Casters also were taken off and discarded.

Refinished chest, right, sports two-tone job in green and cream enamel. Door was removed and a small radio fitted in compartment. New drawer pulls help dress up renovated oak chest.

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paint or varnish remover. If possible, do this work outdoors. If done inside, be sure the room is well ventilated. Brush on the paint remover and when the old finish has blistered and wrinkled, scrape it off with a putty knife. If the old paint is tough and thick, you may have to apply two or three coats of remover to get down to the raw wood. On moldings and carvings, brush on remover and rub out the old finish with steel wool. A sharp stick is handy here, too.

When you've taken off all the old finish, wipe down all surfaces with benzene or turpentine. Most kinds of paint remover leave a waxy residue that may affect the finish.

Fill all nail and screw holes with composition wood. Now you're ready to sand the piece smooth. Use 4/0 garnet paper. After I'd removed the varnish and paint from the rosewood cabinet, I found that someone had spilled a stain on the top. The stain had penetrated the grain, and paint remover wouldn't touch it. To erase such stains, sand the wood down as far as the stain has penetrated. But sand the entire surface down evenly. If you sand only the stained spot, you'll have depression there. A belt sander does this job quickly.

Before you go on to the finish coats, remove all sanding dust with a brush or rag.

You can start to put on the new finish now. There are many finishes you can use, depending on the kind of wood. The rosewood cabinet was stained and then given several coats of paste wax, with hard polishing between coats.

The oak chest was given a coat of flat white. This was sanded lightly when dry. Then the drawer fronts and top were coated with cream enamel. The trim, drawer separators, and sides were enameled green.

To dress up the oak chest, the door of the

Original rosewood cabinet, above, looked like test piece from a paint factory. Besides coat of green, paints of different colors had been spilled on it. Note stained spots on door.

Refinished cabinet, left, does duty as bedside table. Shelves inside cabinet hold linens. After old finish was taken off with paint remover, cabinet was sanded and waxed.

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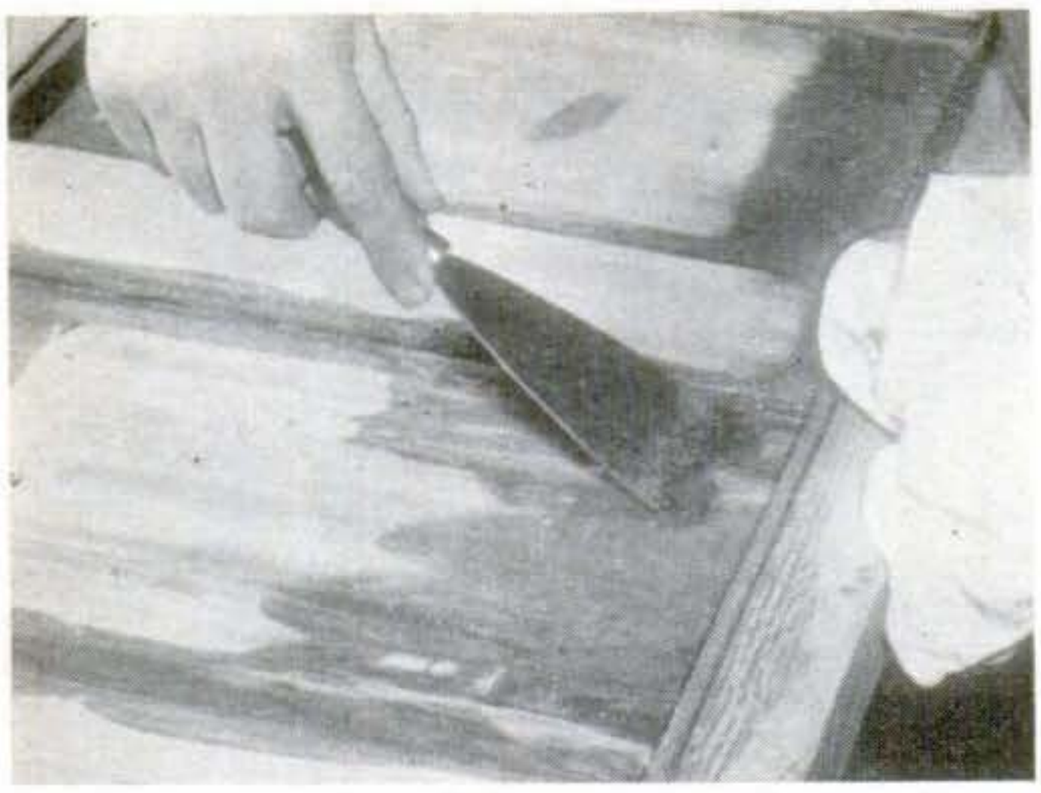
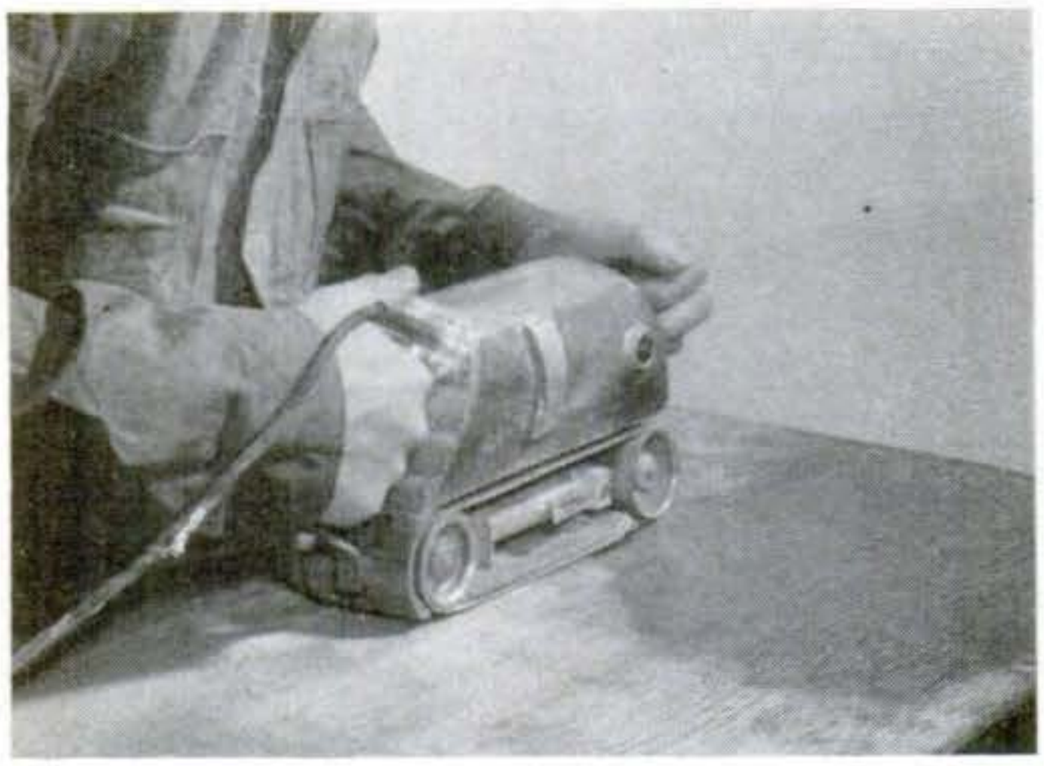


Old finish, softened by a coat of varnish remover, was scraped from side of oak chest with a wide-bladed putty knife.



Top of cabinet was marred by stains that had penetrated grain of wood. Belt sander was used to cut down top as far as stain penetrated.

Raised wooden rings around keyholes in large drawers of oak chest were sanded down flush with fronts of drawers. Keyhole (at left) was plugged with composition wood before chest was painted. Nail holes were also plugged.

compartment was discarded and a small radio placed in the opening. A piece of wood was cut and nailed to block the opening above the radio and ½″ quarter-round molding was used to frame the opening.

Oak can be given a natural finish—that is, a transparent finish through which you can see the grain but one that will also take a polish. Since oak is an open-grained wood, you'll have to use a paste filler to fill the pores and form a level surface for the finish coats. Fillers come in different shades. A darker filler is often used on oak to accent the grain.

Before applying the filler, brush on a coat of shellac diluted one part of shellac to five or six parts of alcohol. Follow the mixing directions on the can of paste filler. When the thin coat of shellac has dried, brush on filler with the grain. After 15 or 20 minutes, wipe off excess filler with a rough cloth or burlap. Wipe across the grain. Follow this by wiping with a soft cloth.

When the filler is dry, smooth it with 2/0 steel wool. Brush on two coats of shellac or brushing lacquer, sanding lightly between coats. Then put on two coats of paste wax.

The oak chest also could have been given a blond finish. First apply filler and while this is drying, mix a little color in oil with flat white paint. You can buy colors in oil at a paint store. Mix the shade you want slowly with the flat white until you get the desired effect. Brush this mixture on the furniture. After about 15 minutes wipe off all surfaces. Let the paint film that remains dry 24 hours. Rub it down with steel wool and apply two coats of brushing lacquer, using steel wool between coats. Finish with a couple of coats of paste wax.

A higher gloss could be obtained on the small cabinet by giving it two coats of brushing lacquer and then two coats of wax. END

After old varnish was removed from oak chest, it was sanded smooth and given coat of flat white. Then green enamel was brushed on.

Rosewood cabinet was cleaned down to raw wood. Stain was wiped on top of cabinet (below). When dry, wax was applied.

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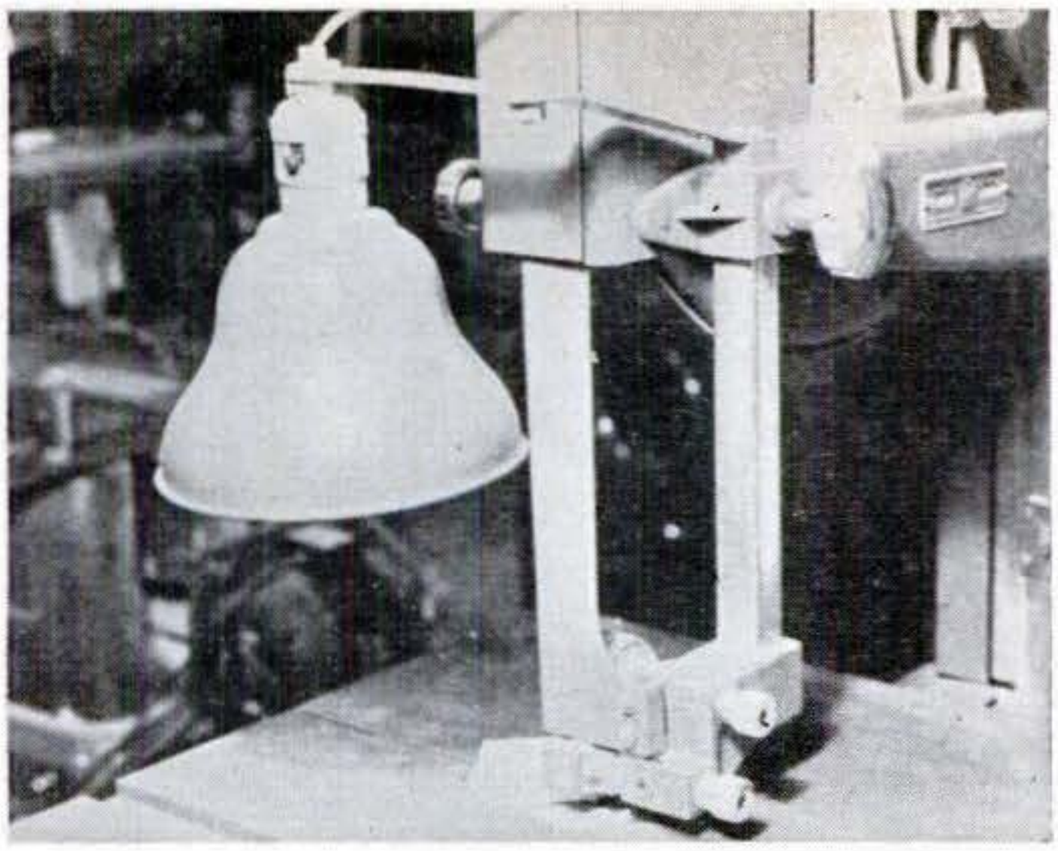


Bandsaw Light Adjusts Self

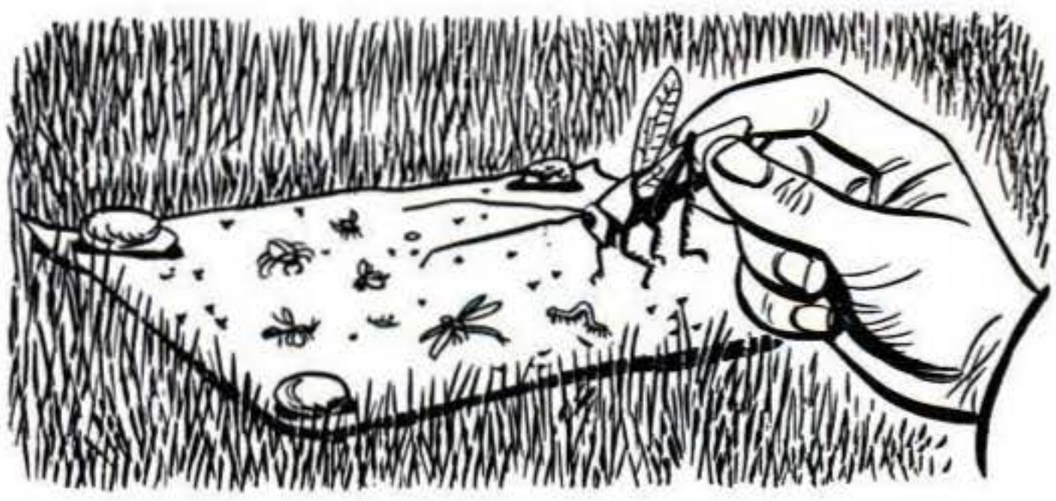
HERE'S a neat solution to the problem of raising or lowering the bandsaw light when making cuts of various thicknesses. The bracket, or supporting arm of the light, is screwed to the top of the guide bar.

When you raise the saw guide to take thicker work, the light goes up with it. Lowering the saw guide for cutting thin stock brings the light down with it. The light is always out of the way and always in the best position to illuminate the work.

For additional convenience, the light may be wired in parallel with the motor so it only burns when the saw is running.—*Herbert Pfister, The Bronx, N.Y.*

Lacquer Improves Jigsaw Job

WHEN jigsawing intricate designs in plywood, you'll get cleaner cuts if you first coat the surfaces with clear shellac and let it dry.—*A. E. Ogren, Chicago.*



Flypaper Catches Bug Bait

IF YOU'RE stuck for bugs for fishing bait, try letting the bugs trap themselves. Take along a few sheets of flypaper and lay them on the ground. Weight the corners with small stones if the day is windy. Bugs don't care where they land, and in a little while you'll find a variety of bait stuck to the paper.—*John Krill, North Lima, Ohio.*

Sprinkler Made from Beer Can

A SIMPLE soldering job will convert a large, conical-top beer can to a decorative watering pot for house plants. Near the bottom, drill a ¼" hole in the side. Bend a piece of ¼" o.d. copper tubing to form a spout and solder it in. Solder the 1/16" thick by ⅜" wide handle in place and enamel the can.—*William B. Eagan, Louisville, Ky.*

Sanding Small Openings

I USE a cotter pin 1" long and a ½" by 3" strip of sandpaper to smooth small openings. One end of the strip is wedged in the legs of the cotter pin. The rest of the strip is wound around the pin in the direction shown and the other end of the paper glued down. This makes a sanding drum about ¼" in diameter. Then I chuck the end of the pin in my electric drill.—*William A. Novak, Maywood, Calif.*

Shop Safety with Oily Rags

IF YOU keep oily rags around your shop to wipe down machine tables and other exposed metal parts, store them in a coffee can and keep it covered when not in use to avoid a spontaneous-combustion fire.

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The ignition switch on the dash wasn't even turned on, yet the engine of Ted's jeep was running fine.

Gus and the

A secret project at the Model Garage gets the local National Guard unit into deep water.

CURIOSITY being what it is, a good many of the Model Garage's regular customers wondered what was going on one morning a few weeks ago. Gus Wilson, its well-known owner, had screened off one corner of his repair shop by stringing an old truck tarpaulin from the

Miracle Jeep

By Martin Bunn

ceiling. Then he had added to the mystery by hanging a large sign on the tarpaulin—KEEP OUT.

To anyone who asked him about it, Gus replied with a pleasant smile and a polite change of subject. As a result, speculation as to what was going on behind the curtain ran wild—including one rumor that Gus was working on a top-secret invention for the Government.

Even Stan Hicks, Gus's helper, was completely in the dark. Gus would tell him nothing. All that Stan knew was that Ted Stevens, who'd served in the Army during the war and who was active in our town's National Guard unit, had driven an Army jeep into the shop late Saturday night and had gone into a long whispered huddle with Gus. When Stan showed up for work the next morning, the curtain was up, and, ever since, Gus and Ted had been spending a good deal of time behind it. Stan guessed that the jeep was behind the curtain too; he'd

heard an engine running once or twice.

"What gives?" Stan finally asked when Gus emerged from his curtained corner for lunch on Tuesday. "Why all the mystery? Can't you even let an employee in on the big secret?"

"There's no big secret," Gus grinned. "Haven't you heard that the National Guard units in this area are holding their annual training encampment over at Danesville starting this week end? Well, I'm just helping Ted Stevens get his unit's jeep in shape for the maneuvers."

Stan knew Gus Wilson well enough to know there wasn't much use asking more questions, so he let it go at that.

Curtain and Jeep Disappear

On Wednesday morning, the "iron curtain," as Stan jokingly had got to calling it, was gone. So were Ted and the jeep. They had disappeared as quickly and mysteriously as they had appeared.

Stan had pretty much forgotten the whole thing when, about 10 days later, Gus made a suggestion:

"How about driving over to Danesville with me this morning, Stan? Understand the Guard is putting on quite a show, and I think we ought to see it."

"But what about all this work that's stacked up?" put in Stan.

"It'll keep," Gus assured him. "Besides, it'll do Joe Clarke good to get his nose out of those books and hold down the fort for a few hours. Wipe that smudge of grease off your nose and let's get going."

"Okay, boss, if you say so," Stan agreed as he clambered into Gus's car. Watching the boys in khaki put on a sham battle might be fun—anyway, it was better than greasing cars on a nice summer morning.

When they drove into the Danesville camp, hundreds of visitors from the nearby towns already were wandering over the reservation. The show turned out to be a series of scattered demonstrations, with signs directing visitors to go from one to another. At one spot, several squads of guardsmen were building road blocks and tank traps. Close by, others were demonstrating chemical-warfare tactics. At a third, a crew was simulating the firing of a World War II antiaircraft gun. Stan really began to get interested.

Gus Leads The Way

Gus, however, paid little attention to anything until he spied a sign that read, "Vehicle Waterproofing Competition." An arrow pointed down a hill that led to the shore of a fair-sized lake that was part of the camp.

"This is us," he said as he led the way.

When they reached the lake, Stan saw five Army cars, their engines running, lined up on the pebbled beach. There were three jeeps, a carryall, and a scout car. Gus and Stan found a spot on the hillside where they could get a good view. They had just about settled themselves on a couple of rocks when a loudspeaker boomed forth:

"Ladies and gentlemen. You are about to witness a unique exhibition and contest. Each of the five National Guard units taking part in this two-week training program has been asked to enter one Army vehicle in this competition. Each unit has prepared their vehicle for underwater operation. This procedure was common practice in landing operations during the last war . . ."

Then the voice went on to explain that on signal the drivers, wearing bathing shorts, would drive their cars into the water until they were fully submerged, except for the drivers' heads and the extended exhaust, air-intake, and gas-tank-vent stacks, and would

[*Continued on page 218*]

Make Trouble Pay

Had any interesting car breakdowns lately? Gus wants to hear about your tough and tantalizing automotive problems. Write him about the false diagnoses as well as the cures. *Popular Science* will pay $25 to the first sender of each usable story idea. Letters can't be acknowledged or returned. Address: Martin Bunn, Popular Science, 353 Fourth Avenue, New York 10, N. Y.

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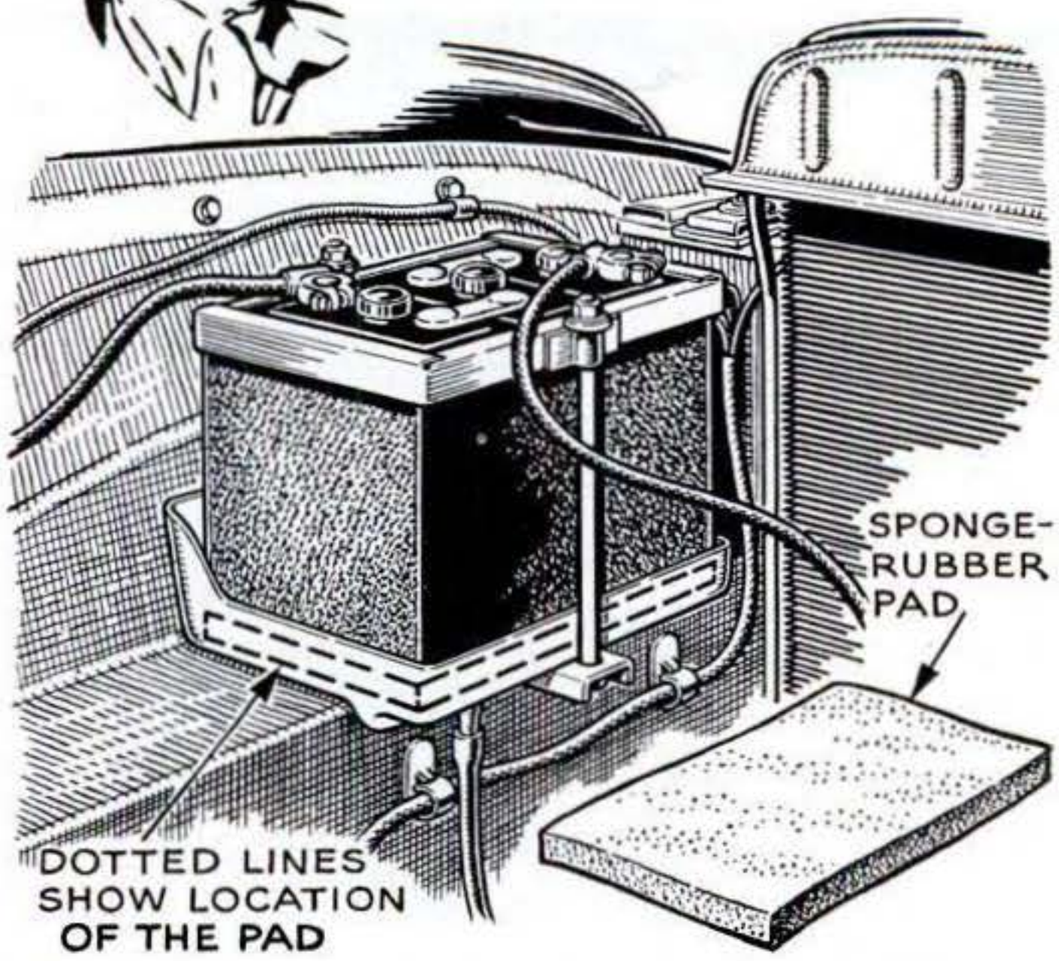
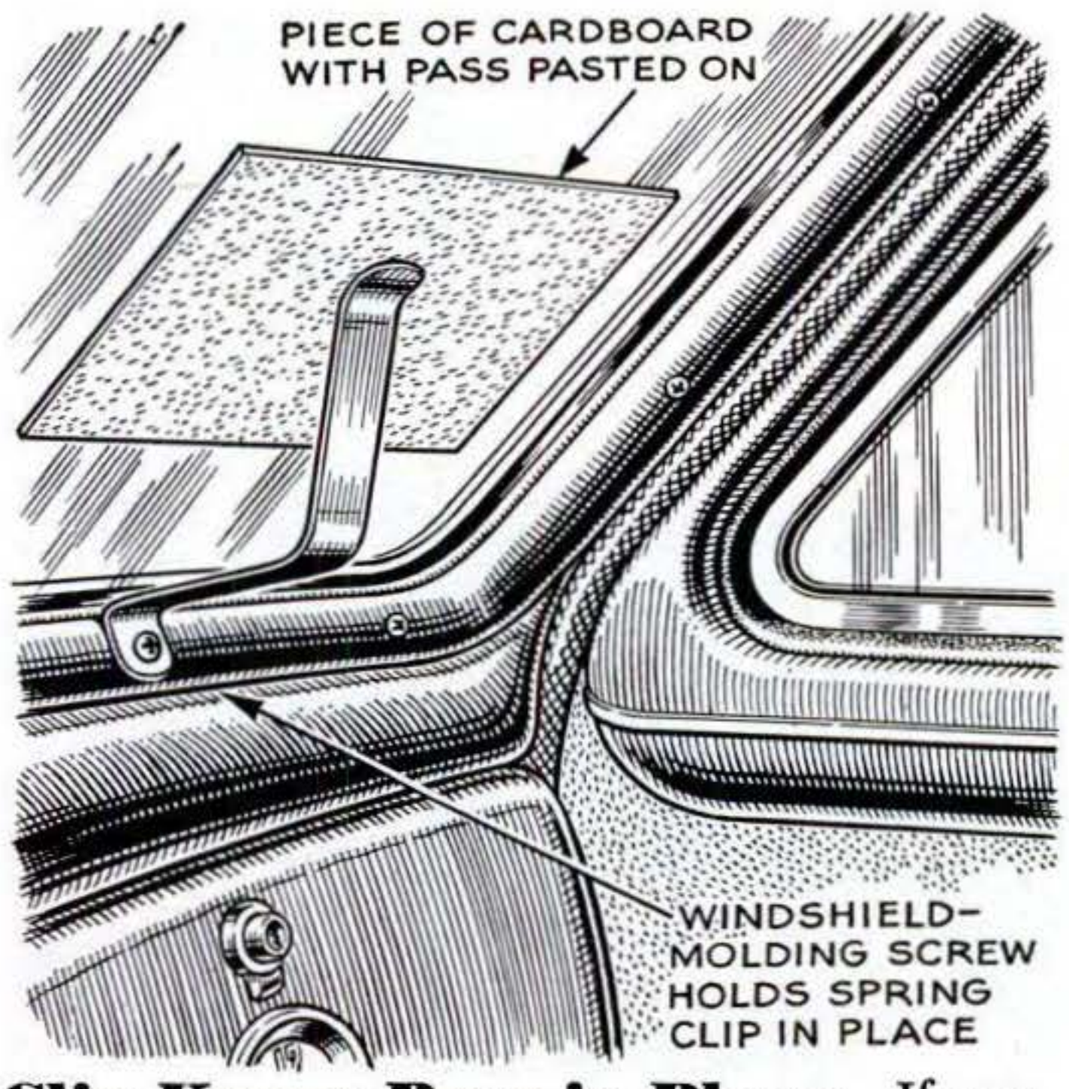
Hints from the Model Garage

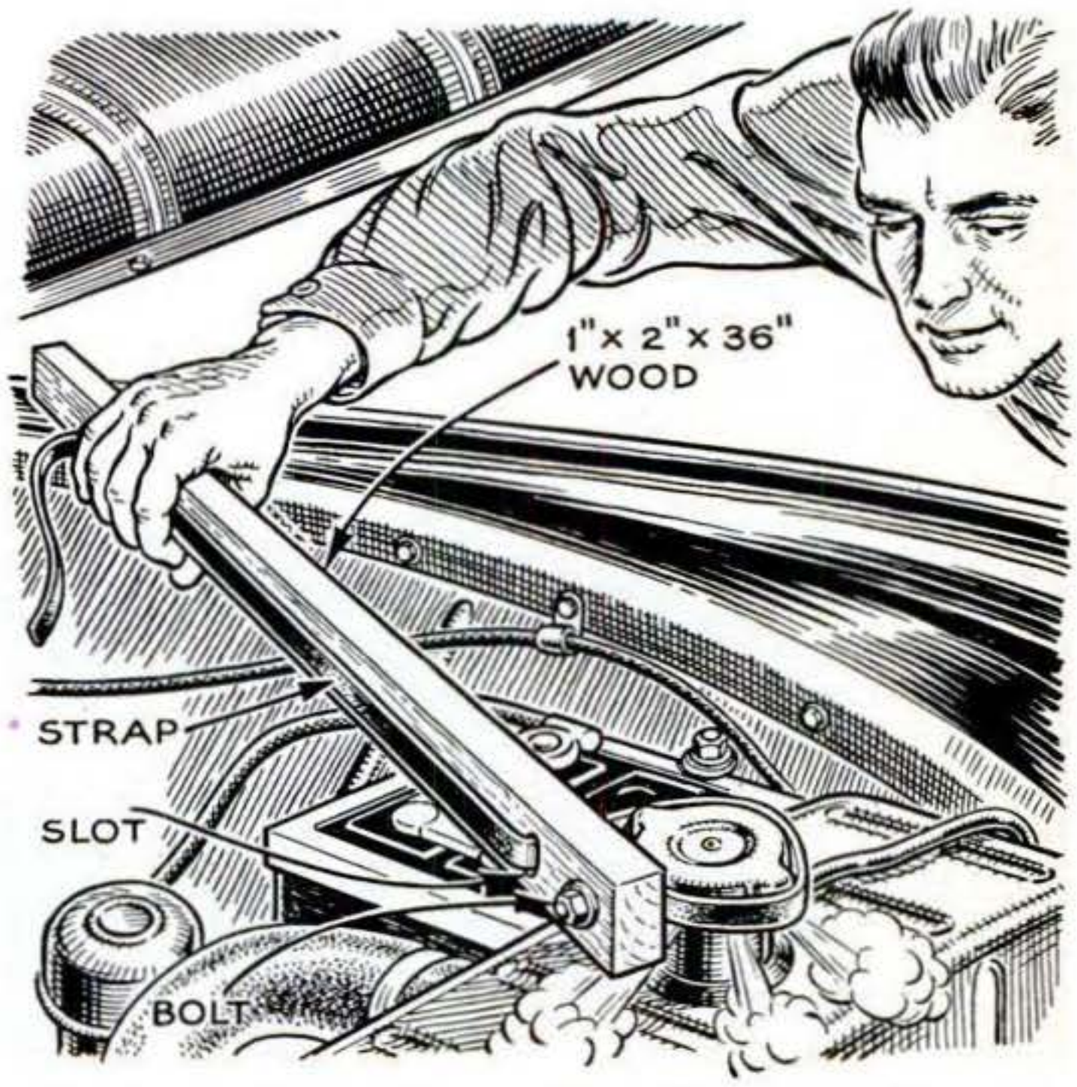


Pad Lengthens Battery Life. A rubber pad placed under a battery will protect it from jolts and jars on rough roads. Even if the hold-downs should loosen, the rubber pad will keep the battery from being damaged by the jouncing.

Bent Wrench Fits Tight Spot. Richard D. Briggs, of Spencerville, Ohio, reports that a wrench like this is one of his most useful tools for working in narrow quarters. To be bent this way, the wrench must be the stamped kind.



Clip Keeps Pass in Place. If you must display a window sticker or card of a temporary nature, for instance a parking pass at a factory or beach, an easily made clip will permit quick placing and removal. Cut the clip from springy sheet metal and paint it to suit the car. Attach it by one of the windshield-molding screws.



Removing Hot Radiator Caps. If a car is steaming, this job can sometimes lead to nasty burns. For his own protection, Marion L. Rhodes, of Knightstown, Ind., rigged up the tool shown above. The leather strap is looped around the cap and pulled snug. The long handle puts the mechanic a safe distance away from the steam.

Turn the page, please, for four more auto hints.

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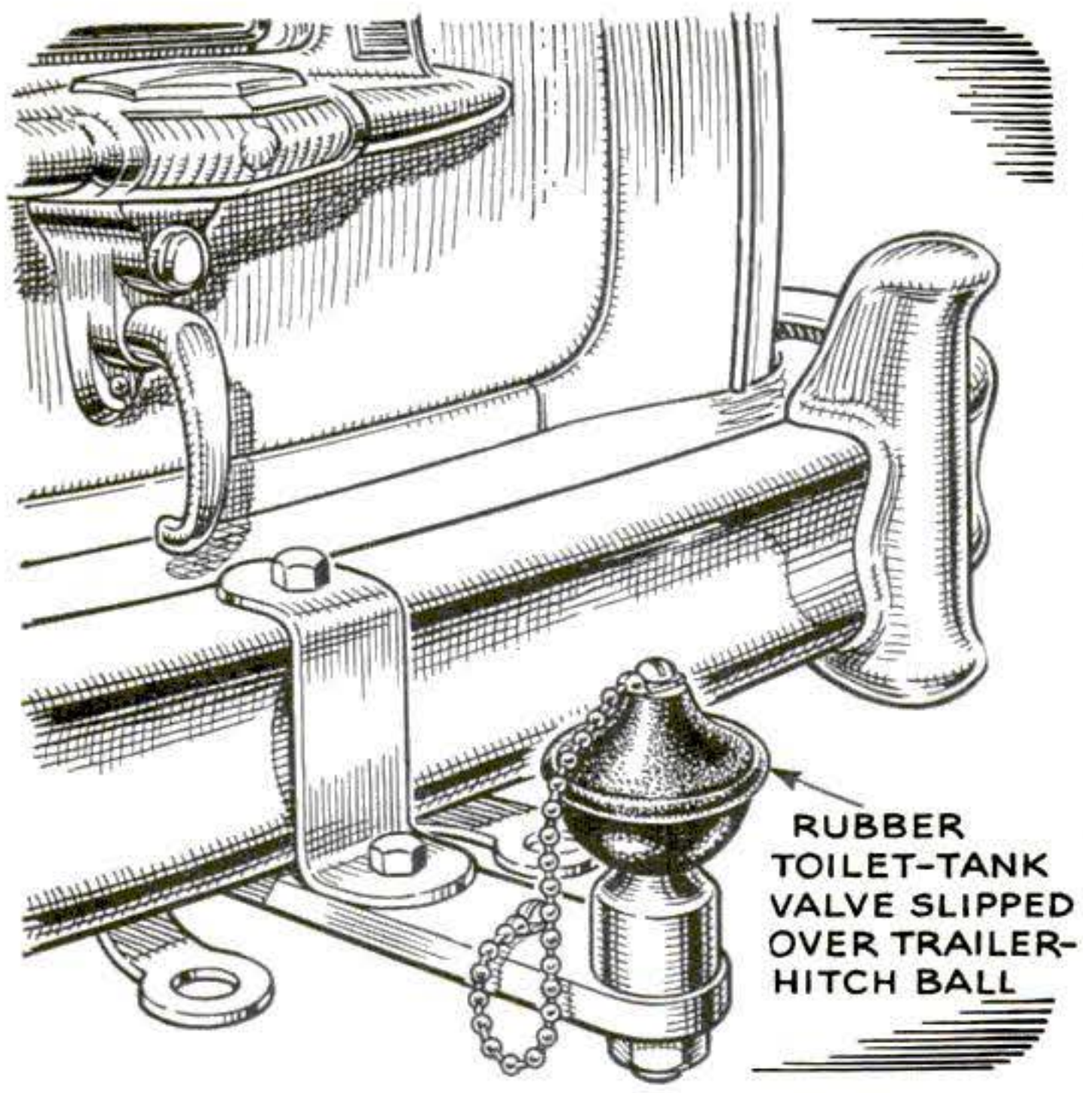
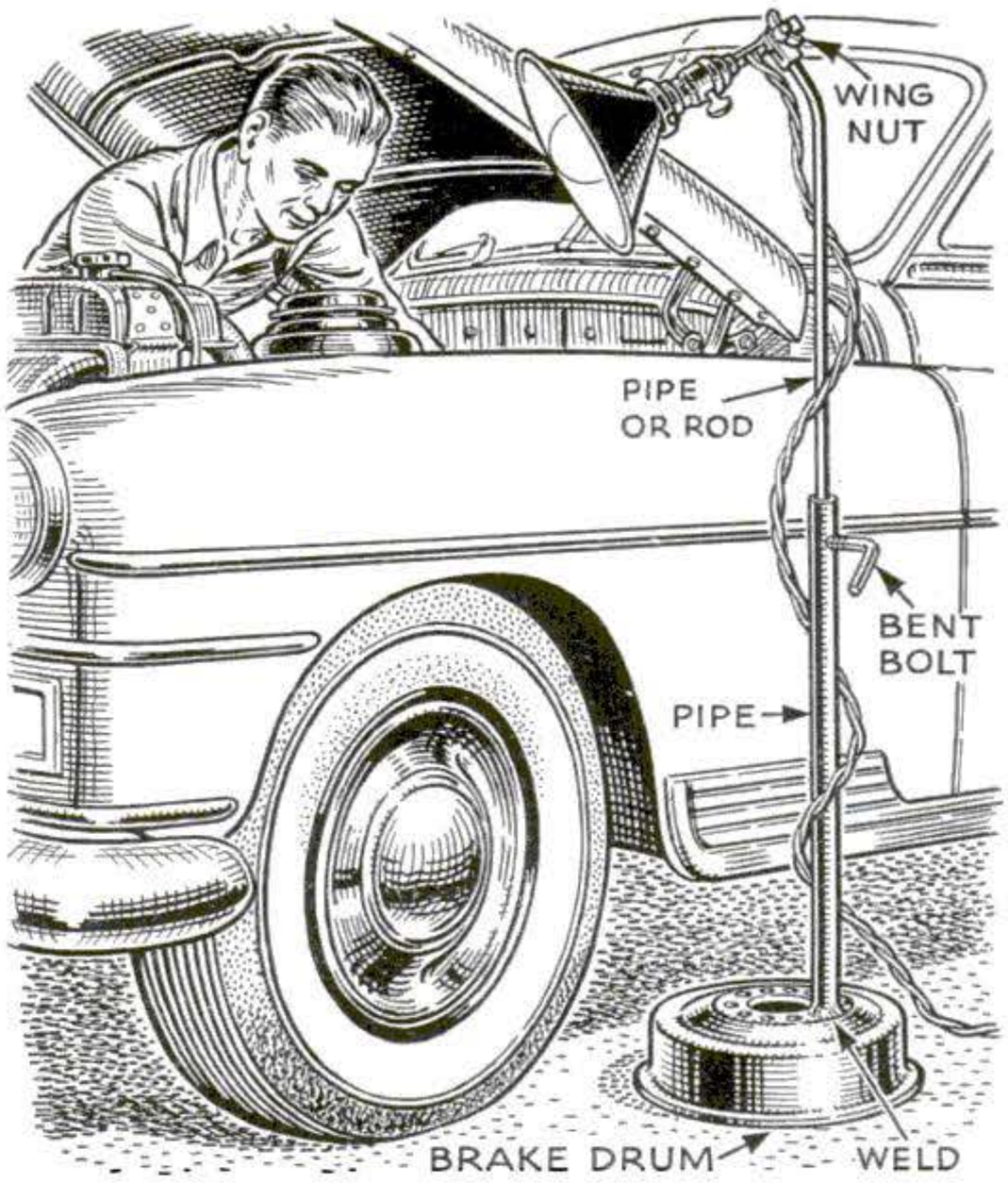
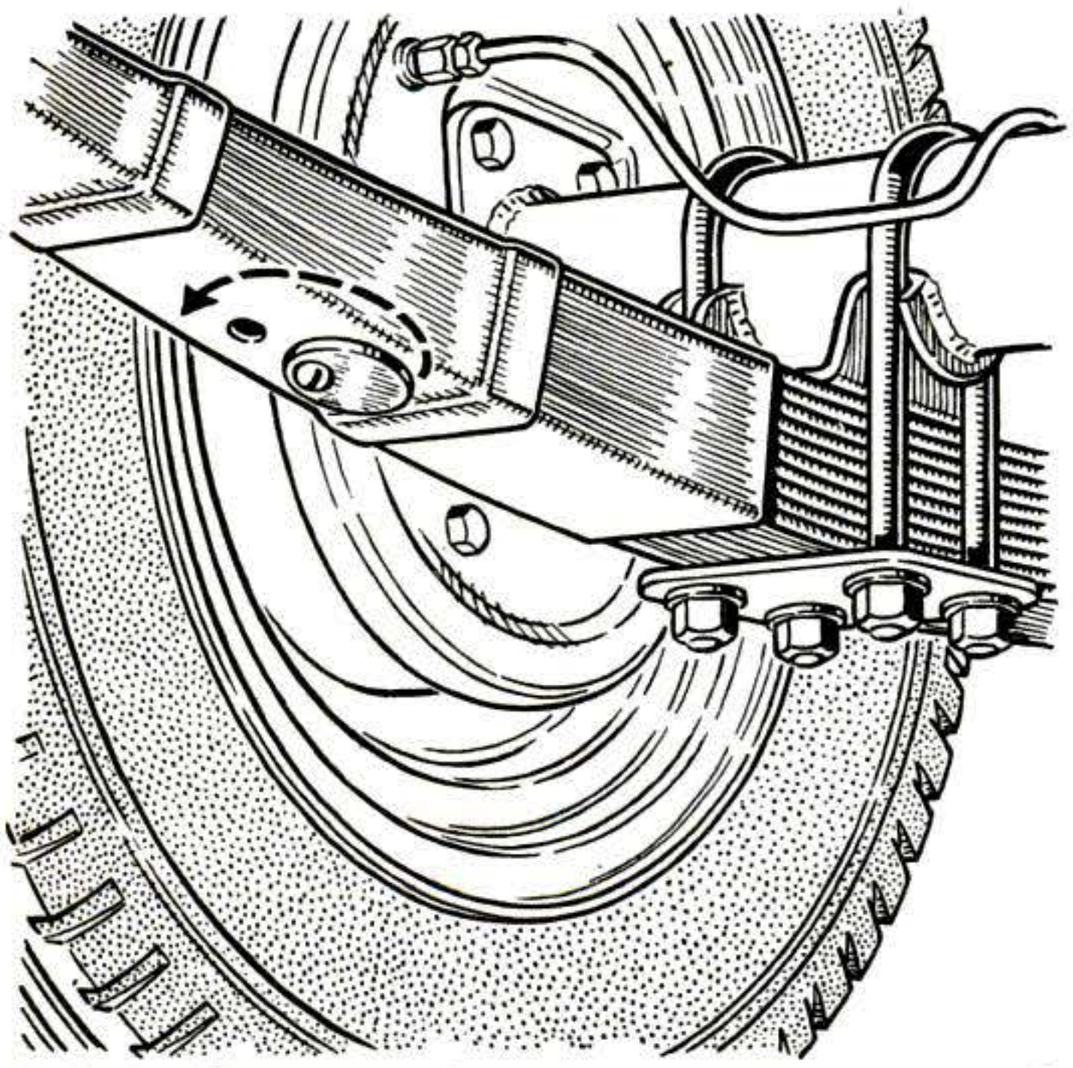
MORE Hints from the Model Garage



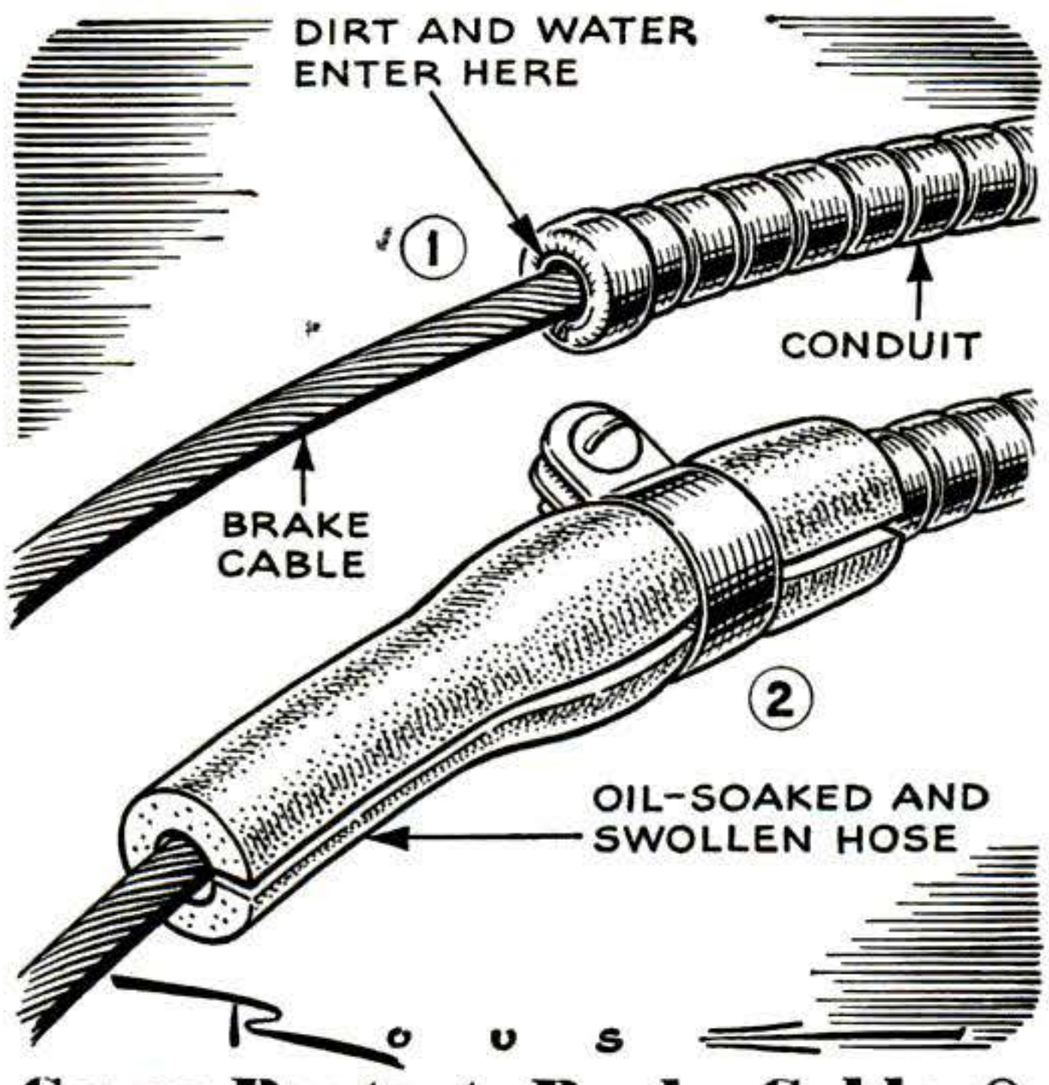
Protecting Hitch Ball. Wallace Genthner, of Troy, N. Y., has found that a rubber toilet-tank valve provides a good way of protecting the trailer-hitch ball on his car. A light chain attaches the ball to the bumper of the car.



Old Parts Make Shop Lamp. Using scrap parts found in any garage, you can quickly make a shop lamp like this one, built in Wilmer D. Crago's shop at Red House, W. Va. The bent bolt in the pipe lets you adjust the height easily.



Disk Covers Spring Oil Hole. If your car has metal spring covers, a metal disk attached as above will keep grease from oozing out after lubrication. Cut the disk the size of a half dollar. Fasten it with a metal screw. Turn the screw tight to keep it over the hole, and loosen it before greasing the springs.



Cover Protects Brake Cable. On the older Fords, dirty and sticking parking-brake cables sometimes give trouble. As in the top sketch (1), dirt and water in the conduit may interfere with brake release. To prevent this, split a piece of rubber tubing and clamp it to the conduit (2). Soak it with oil to lubricate the cable.

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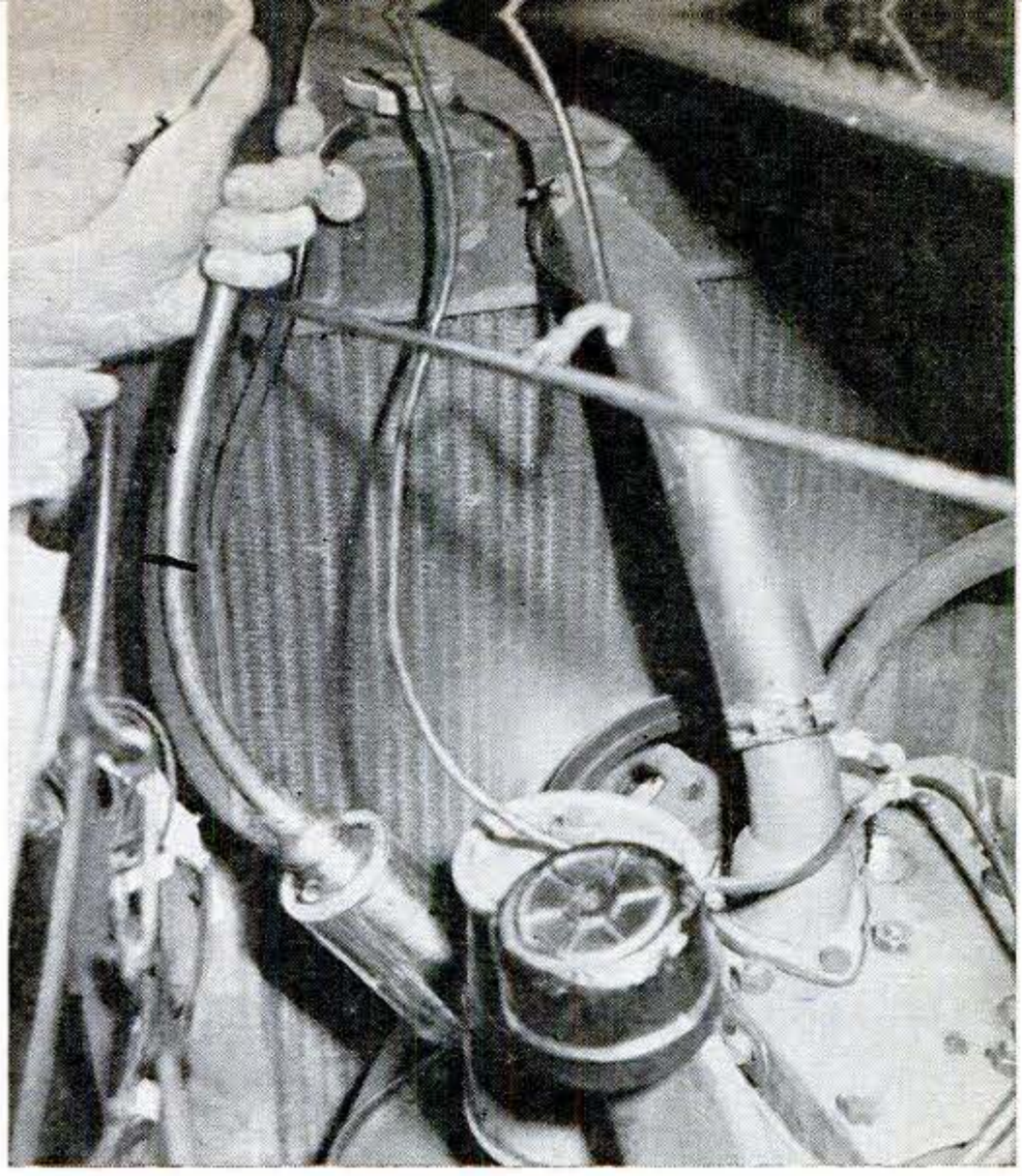
An Ignition Timing Light for a Dollar



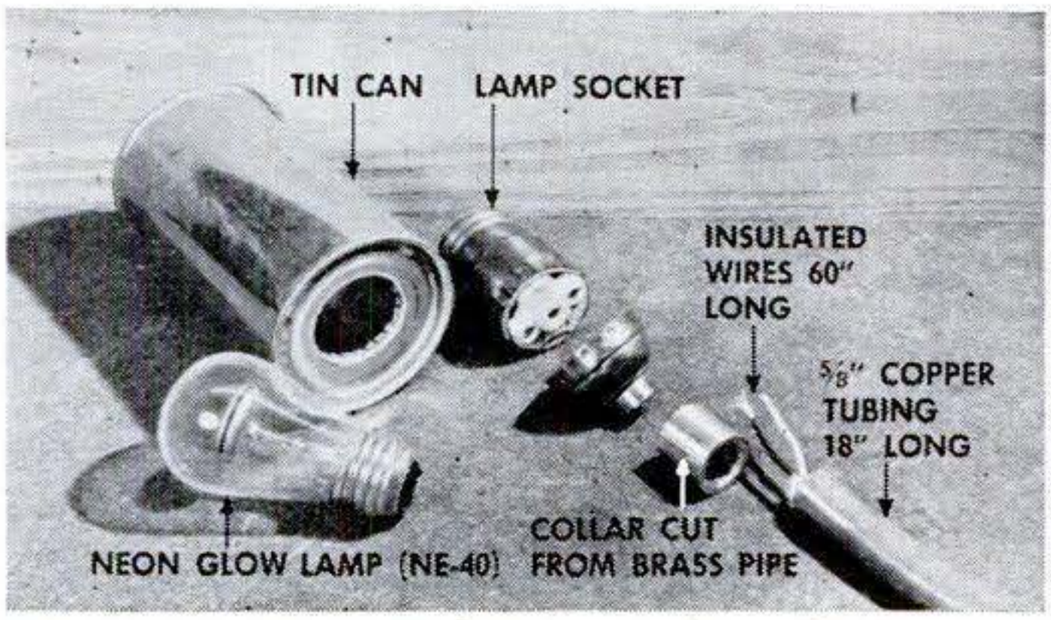
AN ORDINARY neon glow lamp can be turned into a timing light that will let you adjust your car's ignition with great precision. It won't be as bright or as fancy as the kind garages use; but it won't cost ten or fifteen bucks. You should be able to make it in half an hour for less than $1.

Suitable glow lamps, obtainable in electrical and radio supply houses, are the NE-40 and the NE-42. Both are three-watt lamps, the former fitting a standard household socket, the latter a double-contact, bayonet-type auto socket. If you use the NE-40, you'll get the most light by connecting it so the outer electrode is the one that flashes.

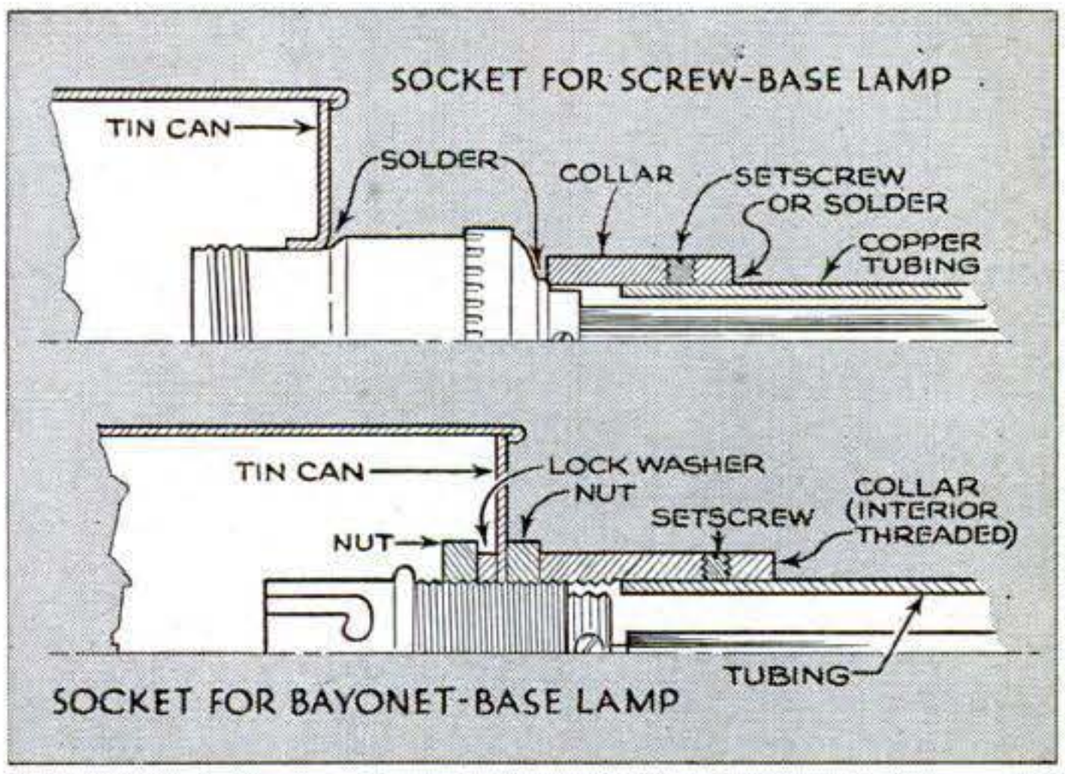
Rig up a small can as a reflector shield. A copper-tubing handle lets you spot the lamp close to the timing marks without getting your hands too close. Use heavy insulation; spark-plug voltages can bite.

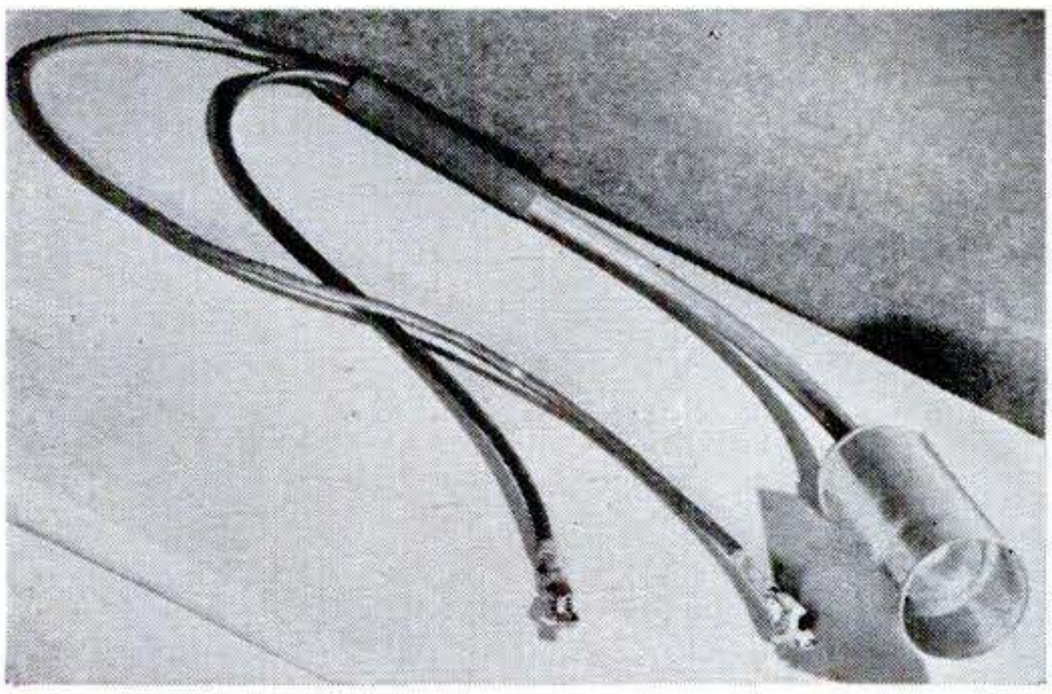
Finish off the leads in alligator clips. One goes to the No. 1 plug and the other to ground on the engine. For visibility, rub chalk on the timing marks, which may be on the flywheel, harmonic balancer, or lower fan-belt pulley, depending on the engine.

The NE-40 lamp has a built-in resistor that lets you also use it on a 115-volt line for such other jobs as checking phono speeds. The NE-42 doesn't have one. END

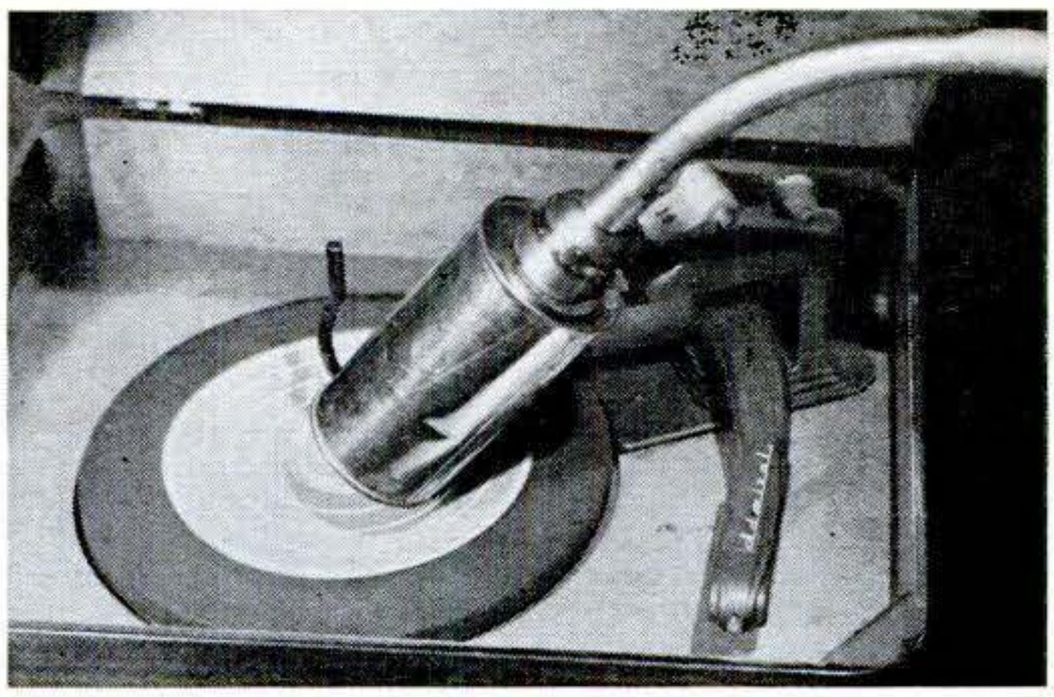


Parts required. Pick a can of small diameter so it'll fit in tight engine spaces. Sketch at right shows how to mount two types of lamps.





Finished lamp. Solder battery clips to wires and insulate the handle with piece of garden hose or by wrapping with electrician's tape.



Light has other uses. For instance, with a stroboscopic disk it will enable you to regulate a phonograph turntable as shown above.

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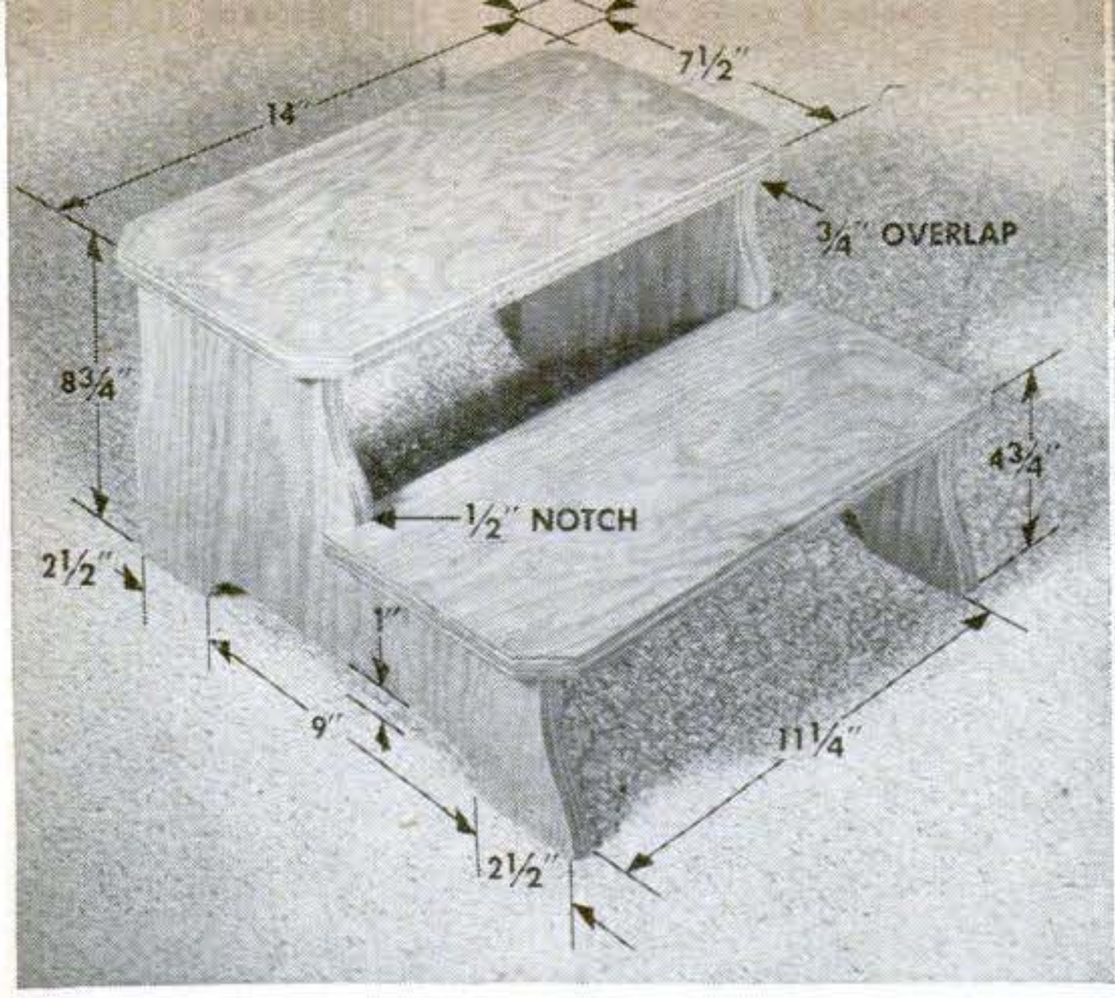


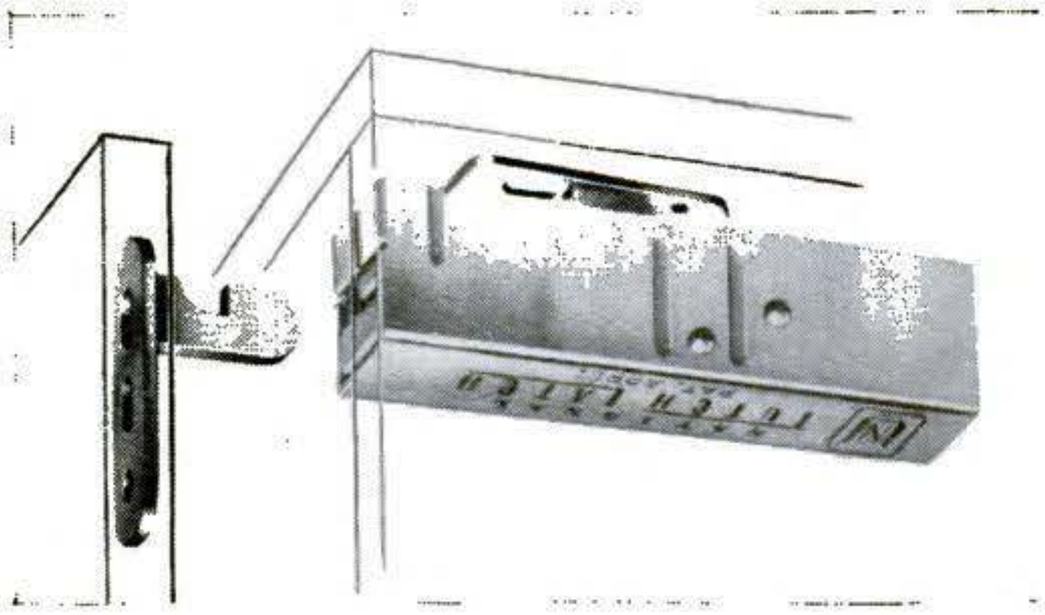
Lightweight Stool Won't Tip Over or Wobble

You'll find lots of uses in your home for this sturdy stool.

All parts are cut from ⅝" plywood. Dimensions are on the photo. You can suit yourself about the curves on the edges of the two vertical supports, but cut them so the front feet project ½" beyond the front edge of the lower step. Cut the step plates to size and bevel the corners. Notch the lower step to fit into the two supports. Sand all pieces thoroughly and assemble with finishing nails, countersunk and plugged over with composition wood. Finish with shellac or varnish. Or, if you prefer a color, give the stool a coat of flat white and then a coat of enamel. As an added touch, linoleum or rubber may be cemented to the steps.—*Roland Cueva, Newport Beach, Calif.*

Touch Opens Cabinet Latch

This latch—made by the National Lock Co., of Rockford, Ill.—is invisible from outside the cabinet. No knobs or pulls are necessary. The latch holds the door shut but when you touch the door, the latch releases and the door springs slightly ajar. It is installed with the strike on the door and the latch is screwed inside the cabinet—under a shelf or on the side of the cabinet.

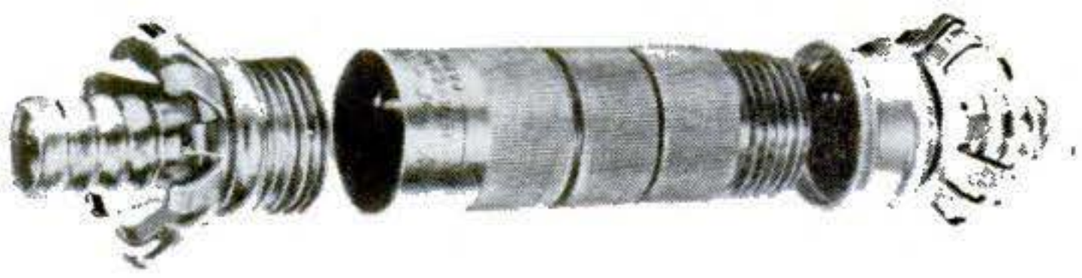


Caliper Made of Plastic

Pictured below is the first caliper to be made of plastic, according to the Plastic Measuring Tool Co., of New York City. Retail price is $1.29. The maker says the instrument is as accurate as a steel one. It has a tolerance of .002". The metal rod measures depths. Inside, outside, and step measurements also can be taken.

Valve Fits in Hose Line

Lawn sprinklers are easy to adjust with this valve (pictured below) in the hose line. Placed just out of sprinkler range, you can accurately control the spray—even if you can't see the sprinkler from the faucet at the house. Turning the knurled center section operates the valve. Such a valve was suggested in *I'd Like to See Them Make (PS, May '50, p. 234).* It's priced at $3.50 by Jetro, Inc., of Bay City, Mich.



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Weigh anchor and set sail for a neatly trimmed lawn. The mower shoves itself—you just go along for the stroll. In five minutes the air-cooled motor can be taken off and the propeller unit attached to convert the power plant back into an outboard.

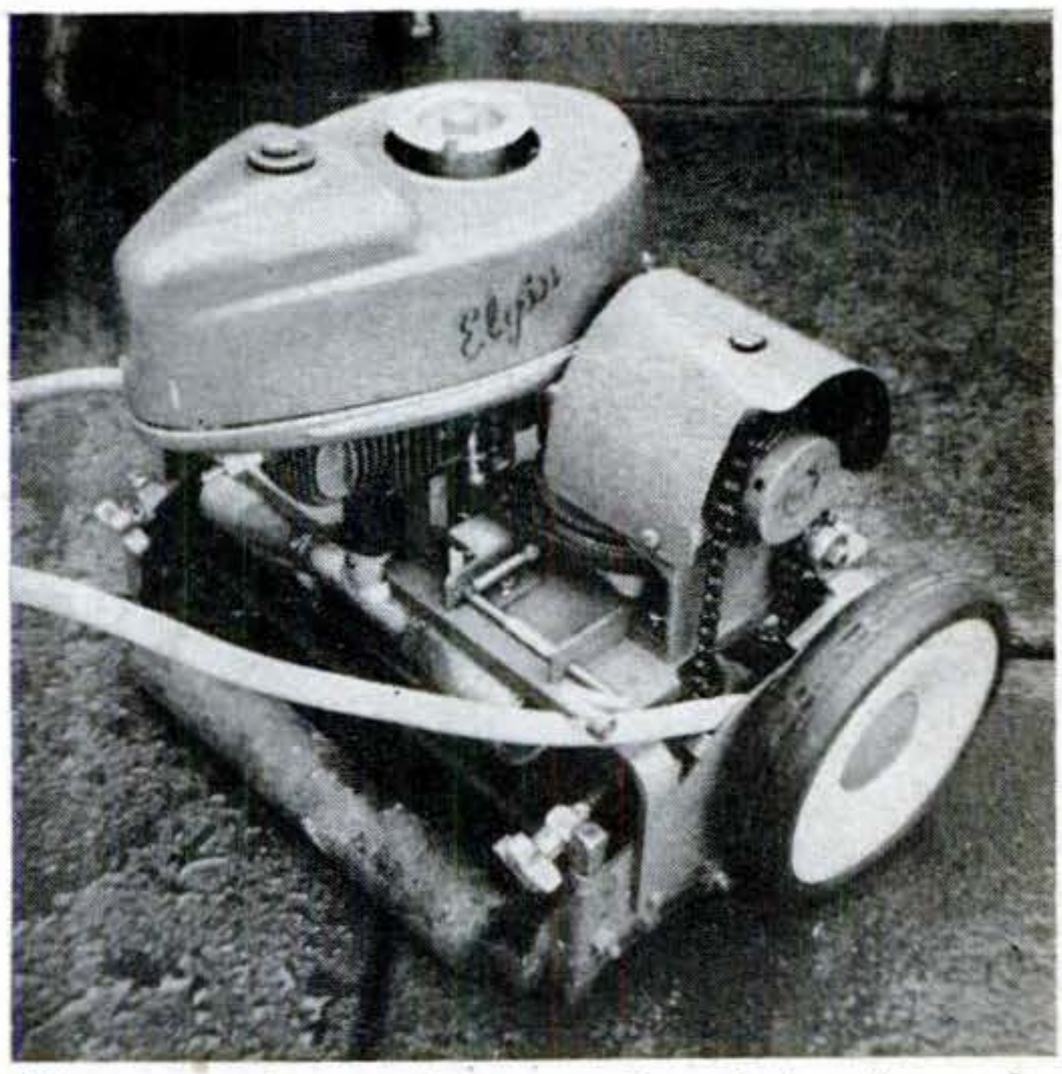
We Mow Our Lawn with an Outboard

By H. W. Bull

WHAT can you do if you want a small outboard motor *and* a power lawn mower—and can't afford both? Stymied by the budget, it looked as though we'd have to wait for one or the other.

Instead, we bought a little air-cooled outboard for less than $60 and a 17″ muscle-pushed lawn mower for $30. We rigged the motor so that it drives the mower but can be detached for boat use. Now we have happy sailing on the water and on the lawn.

Our 1¼-hp. outboard can be separated from its propeller unit by unscrewing four bolts. Then we attach it to a matching steel plate on the mower. The exhaust



Sheet-metal guard covers the chain. A crank, lifted by raising mower handle, tightens the V belt to engage drive. Crank is slid off sidewise for storing mower with handle up.

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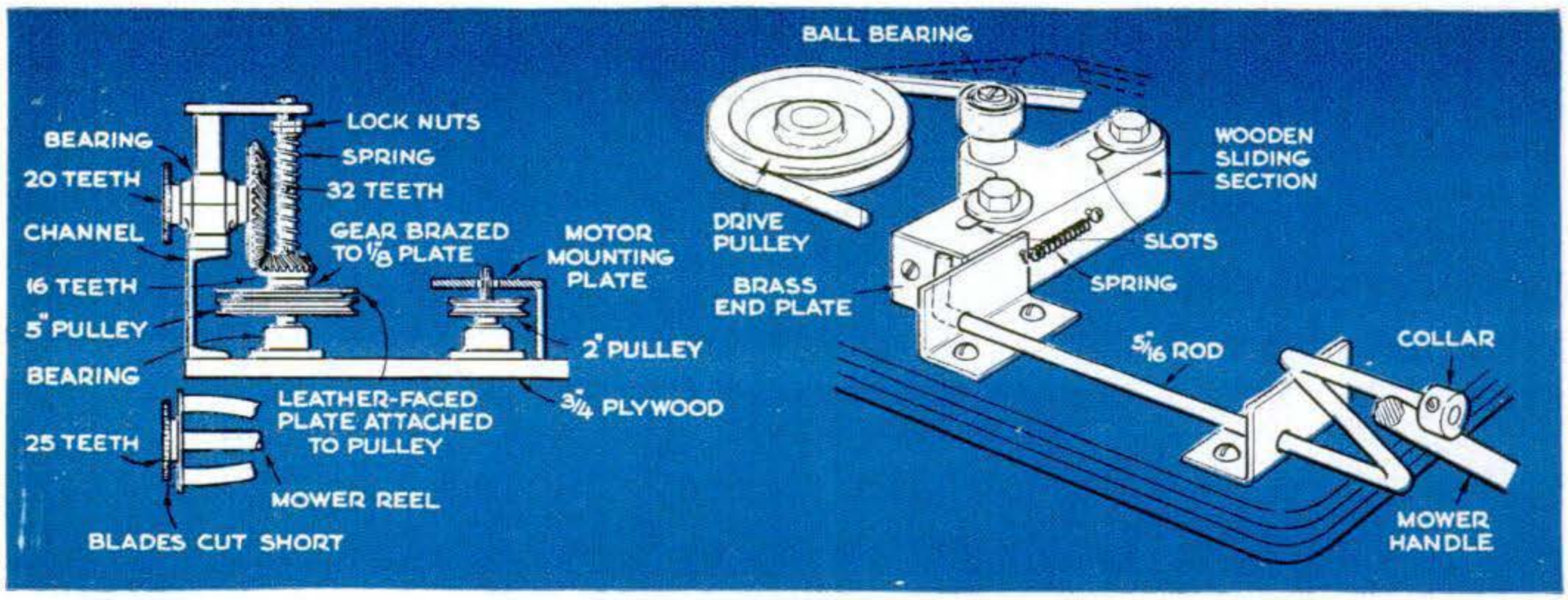
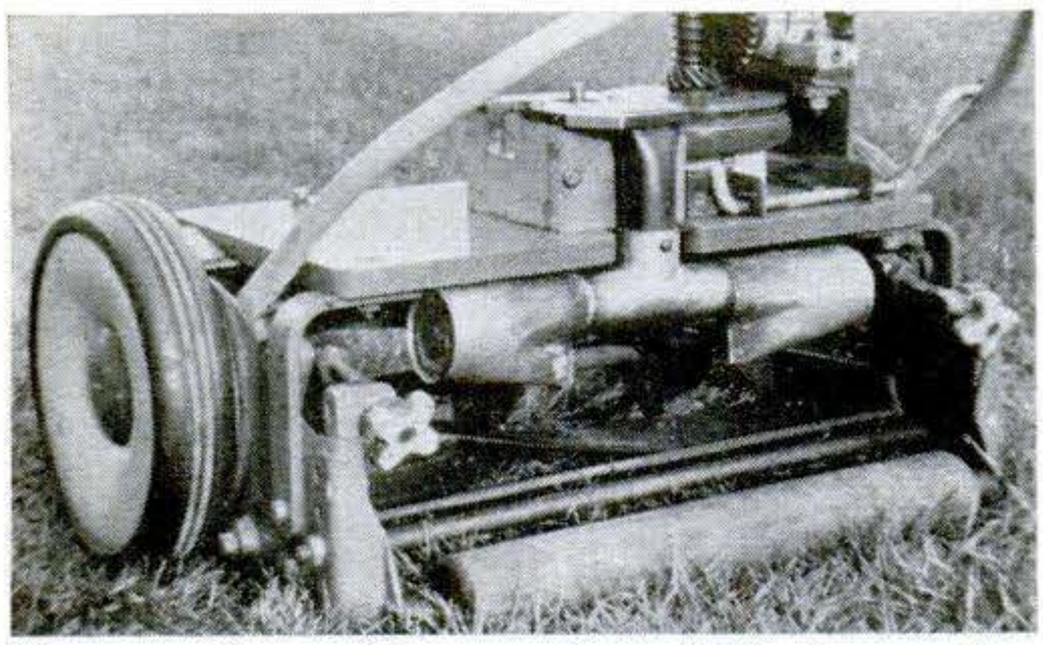
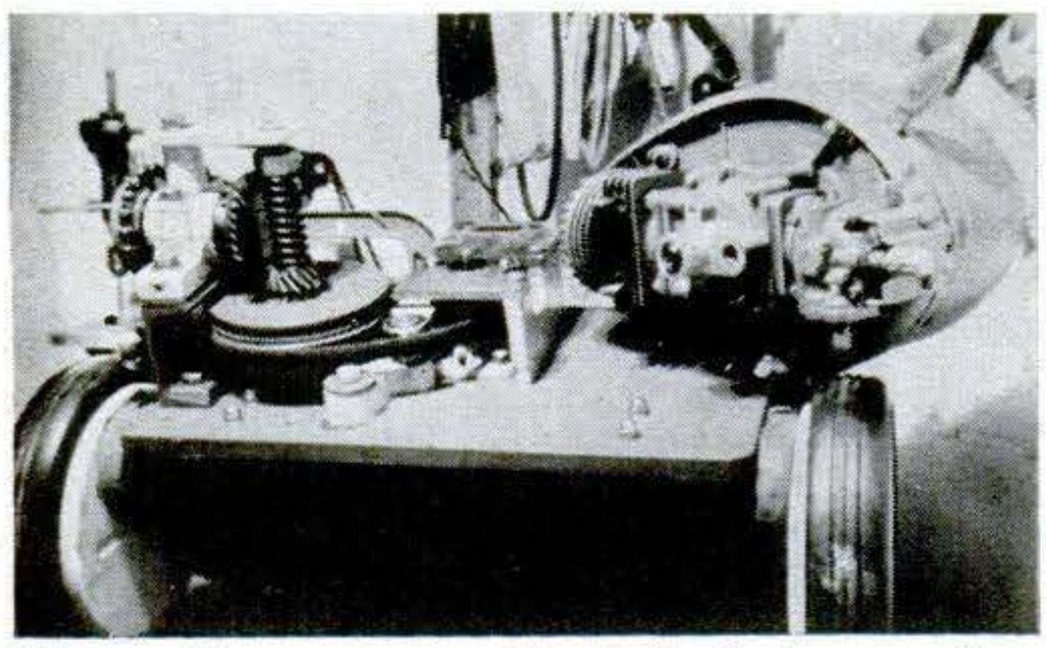




Homemade muffler consists of T pipe perforated at ends. Frozen-orange-juice cans bolted to pipe have open ends facing inward. These are squeezed at bottoms to form narrow slots.



Motor slips onto a splined shaft in mounting plate. A ball bearing mounted on a slotted wooden bracket tightens the belt as mower handle is raised to walking position.

lines up with a section of pipe welded to the plate and leading to a T muffler under the plywood platform. The engine itself weighs only 13 lb., and the switch is easy to make. It takes only five minutes.

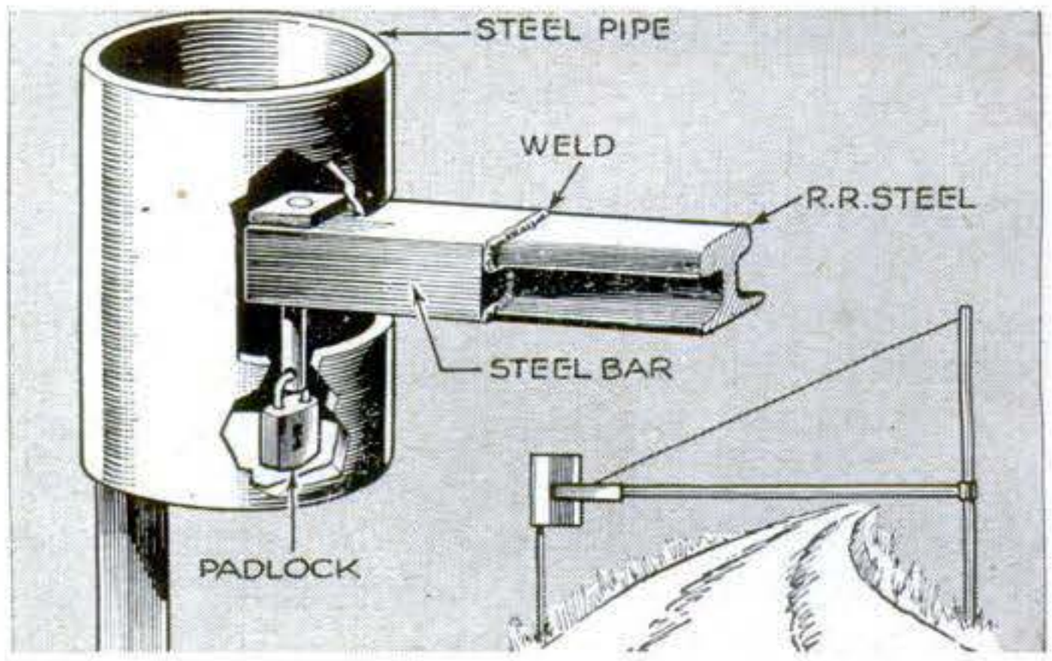
A splined shaft with a 2″ V pulley runs through the mounting plate to engage the motor shaft. The V belt drives a 5″ pulley and, through a leather-faced clutch and a pair of bevel gears, a sprocket from which there's a chain drive to another sprocket on the mower reel. The gear, clutch plate, and pulley all rotate freely on a stationary spindle set into a bearing socket below and held in a bracket above. A spring pushes the clutch faces together.

Slippage in the clutch protects the motor from shock damage if something jams the blades. Operating clutch control is by an idler pulley that normally leaves the belt slack until the mower handle is raised to walking position, when a lever moves the idler to tighten the drive belt.

The motor turns the reel, and the reel turns the wheels through the original pinions inside. At 2,500 engine r.p.m., the mower moves at a reasonable walking speed. Should it get away from the operator, the handle will drop and disengage the idler, cutting off the power. END

Pipe Protects Gate Lock

A LENGTH of steel pipe protects the padlock of the gate at right from trespassers. A hole was cut about one-quarter around the pipe to take a 2″ by 4″ steel bar that was welded to the railroad-iron gate. The steel bar was drilled for the pin and the pin was drilled for the lock. With the lock in place, it's very difficult for anyone to reach the lock with a file or hacksaw, and yet it can easily be unlocked with a key.



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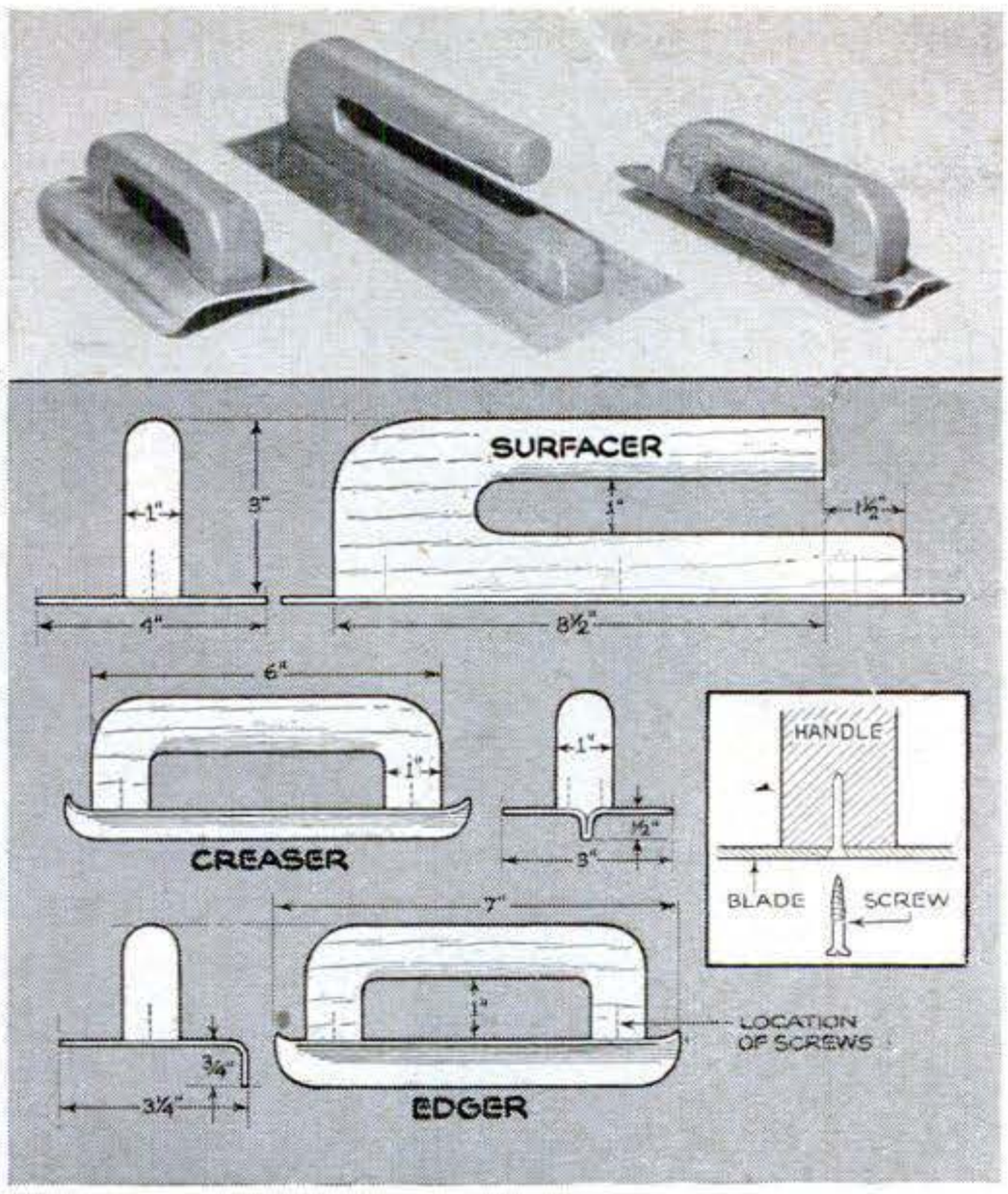
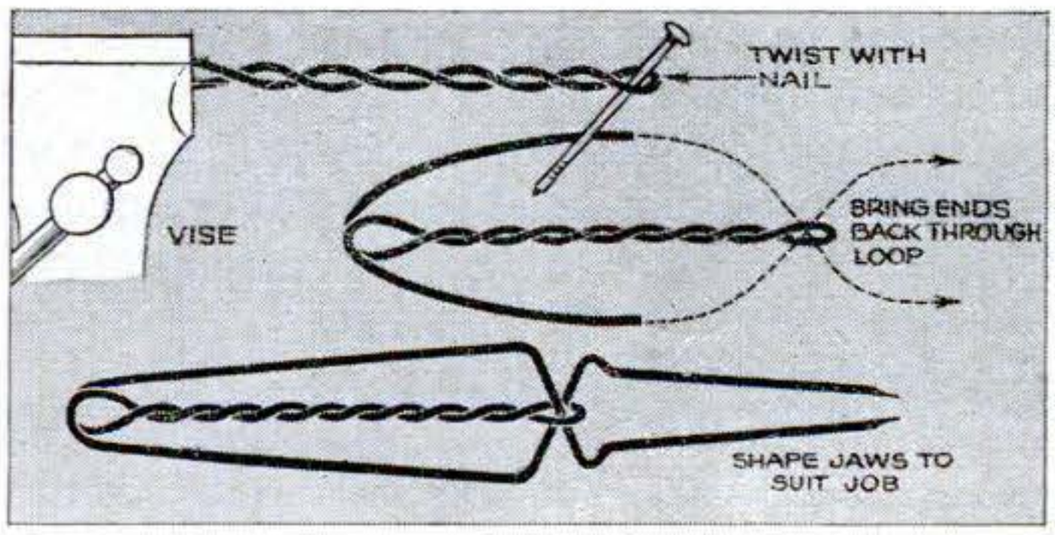


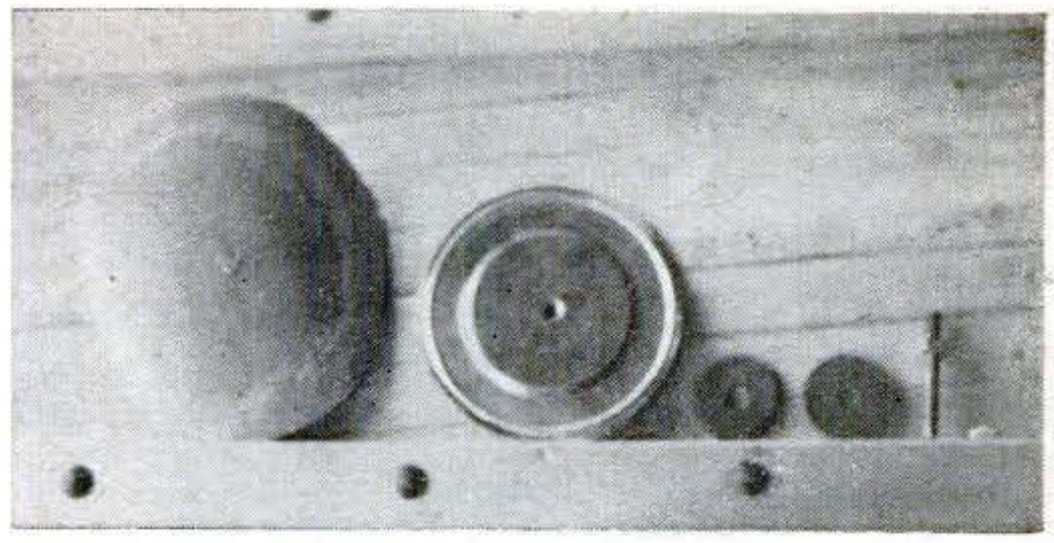
3 Concrete Tools for 20 Cents

An amateur's concrete work often looks bad because he lacks the proper tools. I made my own three finishing tools—surfacer, edger, and creaser—with 20 cents worth of material. I bought 4″ wide scraps of 20-gauge-steel, which had clean edges cut on a big shear. All dimensions and shapes are shown on the drawings. Screw holes in the blades were countersunk so that the heads of the screws used to attach the hardwood handles would fit flush.—*Harold Jackson, Kankakee, Ill.*

Make Your Own Tweezers

Jewelers and modelmakers will find spring tweezers handy for gluing or soldering small parts. Make them by gripping a loop of spring brass or steel wire in a vise and twisting it with a large nail. Then bring the ends back through the loop to form the jaws of the tweezers, as shown below. The jaws may be flattened, bent at right angles, or looped to suit the job at hand.—*John Burroughs, Tacoma, Wash.*

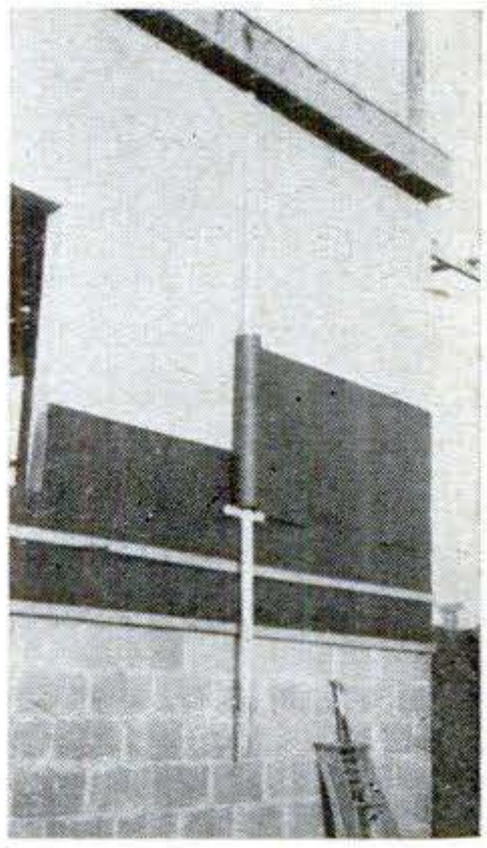




Power Sander Made Quickly

A sander suitable for small jobs on curved surfaces can be made in a jiffy with the parts above. Attach a large disk of garnet paper to a ¼″ electric drill. Cut the head off a ¼″ bolt so that it will fit in the drill chuck. Then place the sandpaper and the top of a coffee can, or some similar lid, on the bolt between nuts and washers. The rim of the sandpaper projecting beyond the lid will bend for work on curved surfaces, but will not tear or crumple if handled carefully. Center the lid and paper accurately. —*E. V. Reyner, Townsend, Mont.*

Rod Rolls-On Building Paper



A rod like this is as good as an extra pair of hands when you put up building paper. Serving as a spool for the roll, it keeps the wind from tearing or wrinkling the paper, and helps you keep it straight.

The rod can be a 12′ length of 1″ by 1½″ lumber, with a 10″ crosspiece of the same material fastened to it with a single nail to support the roll of paper at whatever point you want it. A spike driven in at an angle through the long member about 2″ from the top will serve as a hook to hang the assembly from the rafters plate or the eave. By lifting the hook clear from the plate and unrolling the paper a few inches at a time as you need it (see photo), you can easily keep the paper under control.—*D. W. R. McKinley, Ottawa, Canada.*

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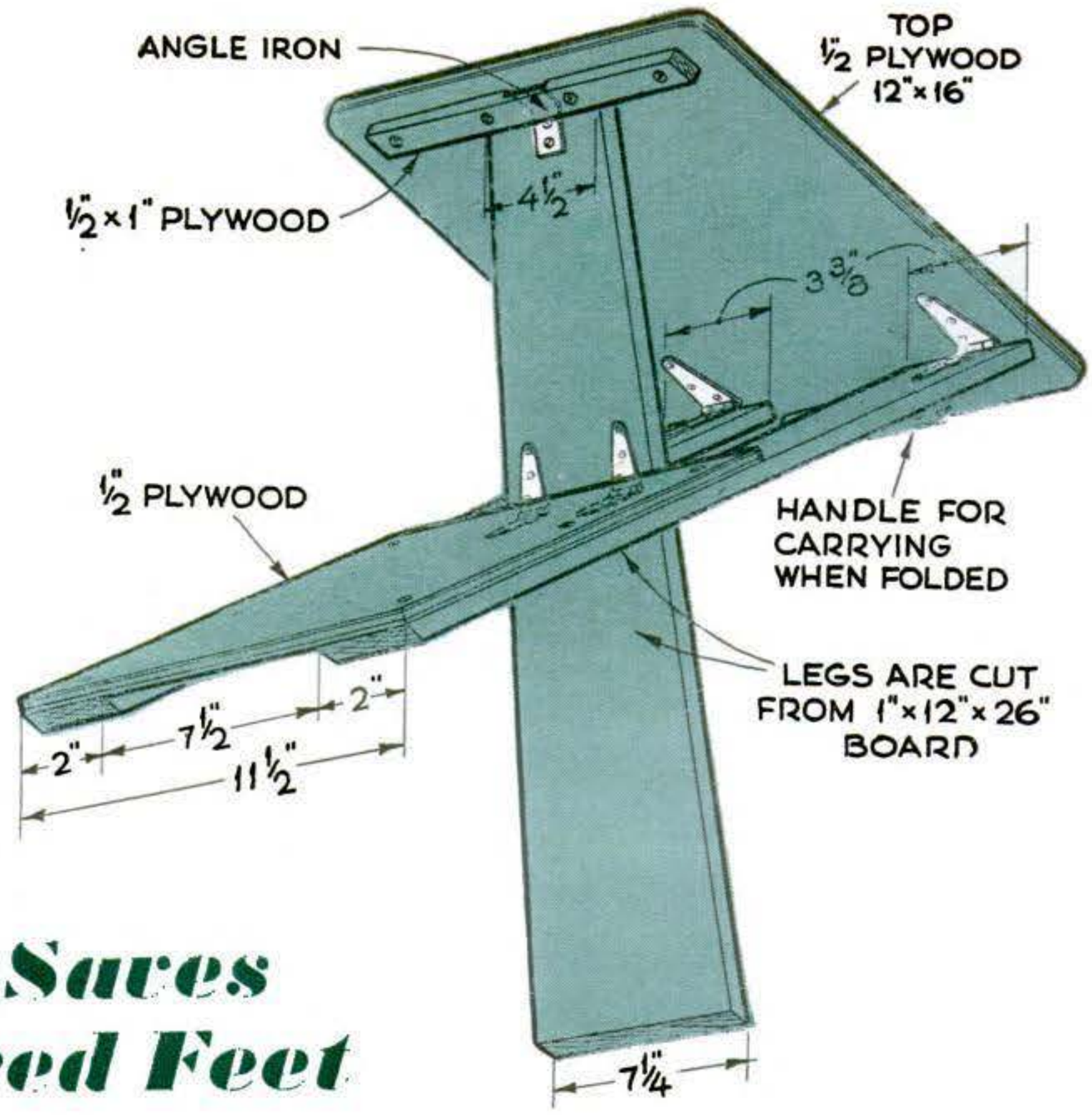
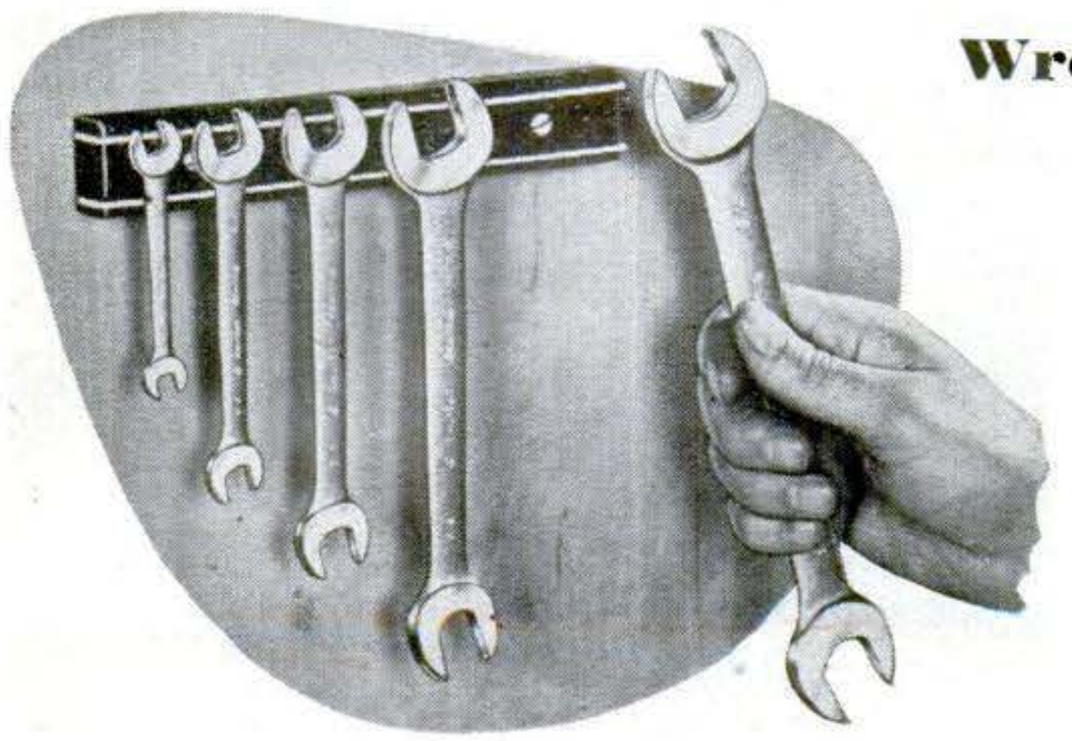


Folding Stool Saves Space and Tired Feet

SPACE SAVERS are always in demand in small kitchens. The stool shown here fills the bill. It's designed for use at worktables 36″ high and it folds flat for storage between the wall and refrigerator or in any other narrow space. If you want to adapt it to a 30″ table, just make the legs shorter.

You'll find the stool both easy and inexpensive to build. The legs are cut from one piece of 1″ by 12″ by 26″ stock. By making two diagonal cuts, all three legs are formed. One-inch solid stock can be substituted for the ½″ plywood seat if the seat is strengthened by heavier crosspieces.

Two pairs of 3″ strap hinges, a 2″ angle bracket, and a few screws supply all the needed hardware. The cleats and leg-spacing panel are glued and screwed. Cut the angle bracket to lock under one cleat.—*Robert Hoppough, Encino, Calif.*



Wrench Sets Have Magnetic Holder

FEATURE of this wrench set is the 8″ permanent-magnet holder that is easily screwed to a wall, workbench, or tool chest. The manufacturer, the Billings and Spencer Company, of Hartford, Conn., supplies chromium-plated wood screws for mounting the holder. The wrench sets are available in open-end and combination patterns. Open-end sizes (pictured at left) range from ¼″ to ⅞″. The combination pattern sizes run from 7/16″ to ¾″.

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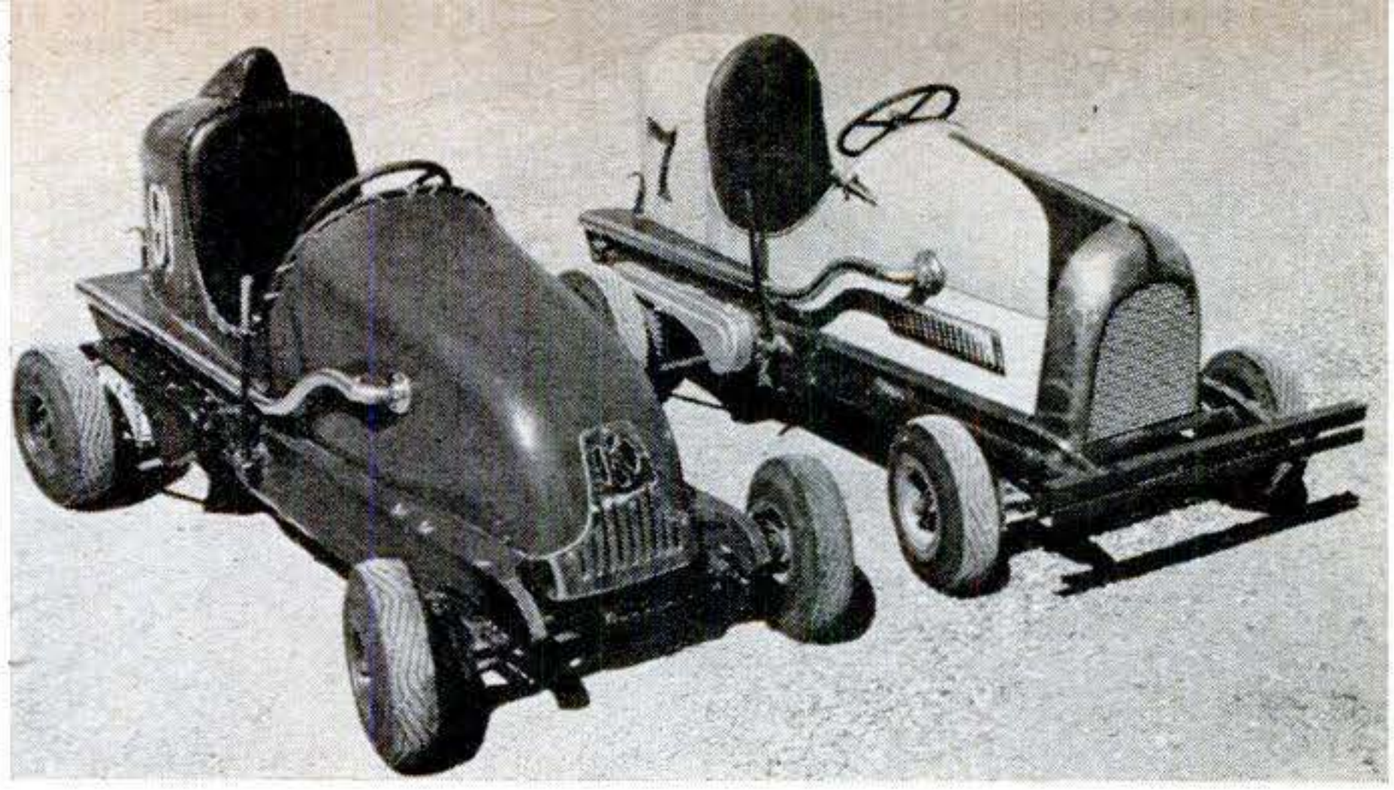
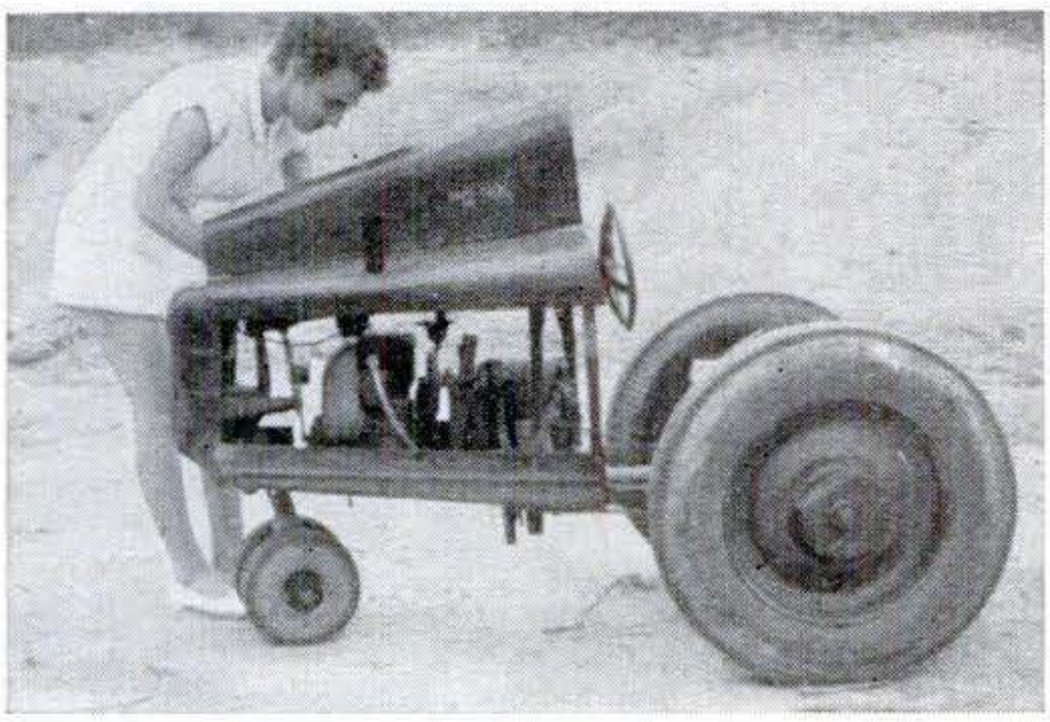
Built by PS Readers



Twins in Family. The Krieg brothers, of Coeur d'Alene, Idaho, found that their No. 7 midget car was so popular with the youngsters they built No. 9 to give it some competition. The two cars are similar in everything but details. A ¾-hp. rear-mounted engine is V-belted to a countershaft that has a positive-drive clutch, and a chain from the countershaft drives the right rear wheel. Steering gear is revamped from Model-T Ford parts. Each car is about 5½ feet long, and weighs 135 pounds.

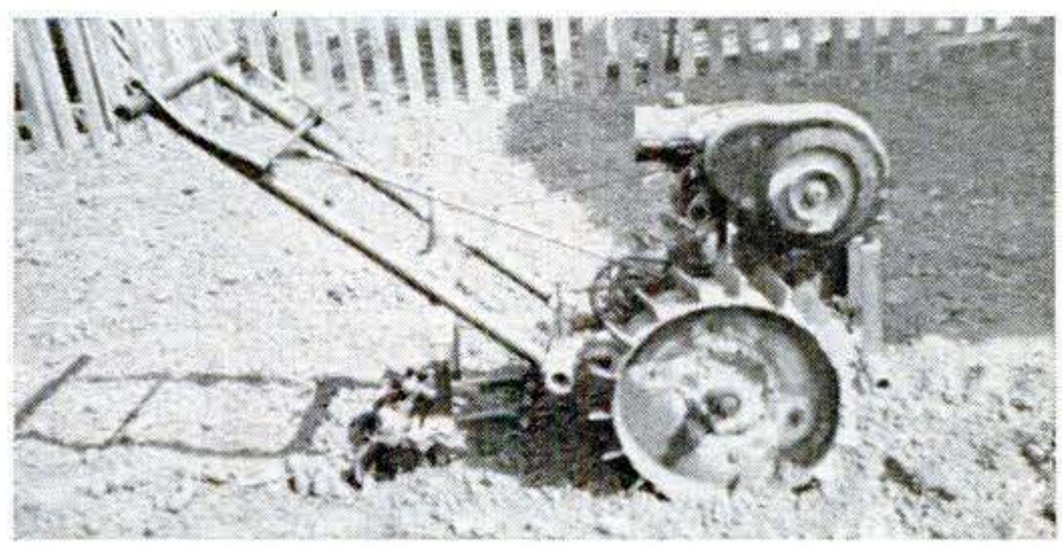


Toy Tractor No Toy. Though he built it for his young son, Thomas McKenzie, of Pinehurst, N. C., has found many grown-up uses for this little tractor. He says that it has the pull of a mule, and he's often put it to work hauling topsoil, wood, and coal, as well as for plowing the garden.

Parts from at least four cars went into the tractor. There's a little bit of Chevrolet, Ford (Models T and A), and Dodge between the wheels. The engine's from a motor scooter. Some of the tractor's features are separate rear-wheel brakes (an aid in turning), three-speed transmission, kick starter, hand throttle, and an auto-type clutch. Top road speed is 10 m.p.h.

Pedals Paddle. This craft gives Dolores Dein, of Farmingdale, N. Y., a strictly unusual ride. Her father, William Dein, built this water bike from some surplus wing floats and an old bicycle frame. The floats and platform are joined by a steel frame. Bike pedals linked to boat paddles drive the light, high-riding craft.

Versatile Two-Wheeler. A power take-off makes this homemade tractor a particular handy implement to have around. The 1-hp. air-cooled motor is located up in the open so that its drive shaft can easily be linked to a rotary snowplow, circular saw, or other machine. John W. Foss, of Los Angeles, built the tractor and uses it for plowing, harrowing, and cultivating.



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How we replaced a jumble of cabinets with a planned combination that gives us home entertainment at its best.

By Richard E. Prentice

PS photos by W. W. Morris

We Built a Family Theater in Our Living Room

A HOME-THEATER corner has turned our parlor into a place with built-in entertainment for the whole family. We've combined the best in radio, television, and record-playing units in an arrangement that makes them all look as if they belonged. And best of all, we got rid of the rabbit warren of tangled wires and unmatched cabinets and boxes that had been cluttering up the room.

It all started when I bought an automatic record player—the kind that handles both standard and long-playing records. Holding the changer under one arm and a bundle of records under the other, I trudged happily into the house. My wife and two young sons crowded around. With a dramatic flourish I started to unpack the new treasure. It's very hard to be dramatic when you have to unpeel a dozen cardboard wedges, but I finally got the changer and records propped up on the coffee table.

"There," I said proudly, and looked into Jane's face, expecting to see a smile of pleasure.

If she felt like smiling, she concealed her feelings successfully. She frowned at the record player as if it were something designed to produce smells instead of sounds. "Where are you going to put it?" she asked in a flat voice.

"Oh, on top of the radio, or television set, or . . ."

"Or nothing! That precious junk of yours has made a shambles of this room." After the manner of most wives, mine was pretending that everything she didn't like belonged to me.

But she had a point. Radio, TV, a phonograph, might be fun to have, but they looked a mess. I realized that we'd need extra space to store records. And deep down in my heart I was harboring a yen for a tape recorder. I didn't mention that. Instead I said:

"Why don't we build a cabinet—combine everything in one unit?"

As I looked around the room, Jane said nothing to dampen my

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enthusiasm. When I came to my senses a few hours later, I realized that she must have had that in mind from the beginning. She grabbed up my suggestion like the last man at the boarding-house table. Suddenly she turned all smiles, produced a pencil and paper, and started making plans.

Jane has a nice sense of design. She also has a feminine approach to technical details: if they get in her way she ignores them. Her first plan was compact. It looked like a dream on paper. I felt obliged to point out, however, that in order to make things fit we'd have to trade in our TV set for one with a 3-inch screen. We would also have to listen to the radio via headphones since she had neglected to allow space for that nasty old loudspeaker.

She then tried a new approach on a much grander scale: everything was to be built in and concealed. Timidly I suggested that our next-door neighbors might object to having the back of our television receiver project 8 inches into their dining room. (We live in an attached house.)

We stared at the walls for a few minutes. "Look," Jane said at last, "why don't you make a list of the technical requirements? Then I'll design cabinets to fit."

That sounded like good sense to me and I told her so. "But," I added, "there's no point in going to a lot of trouble and expense over something that we'll grow tired of in a year. Let's make this a really first-rate job."

Here's the assembly after we added the speaker cabinet. My wife thought it improved the sound but didn't help the appearance.

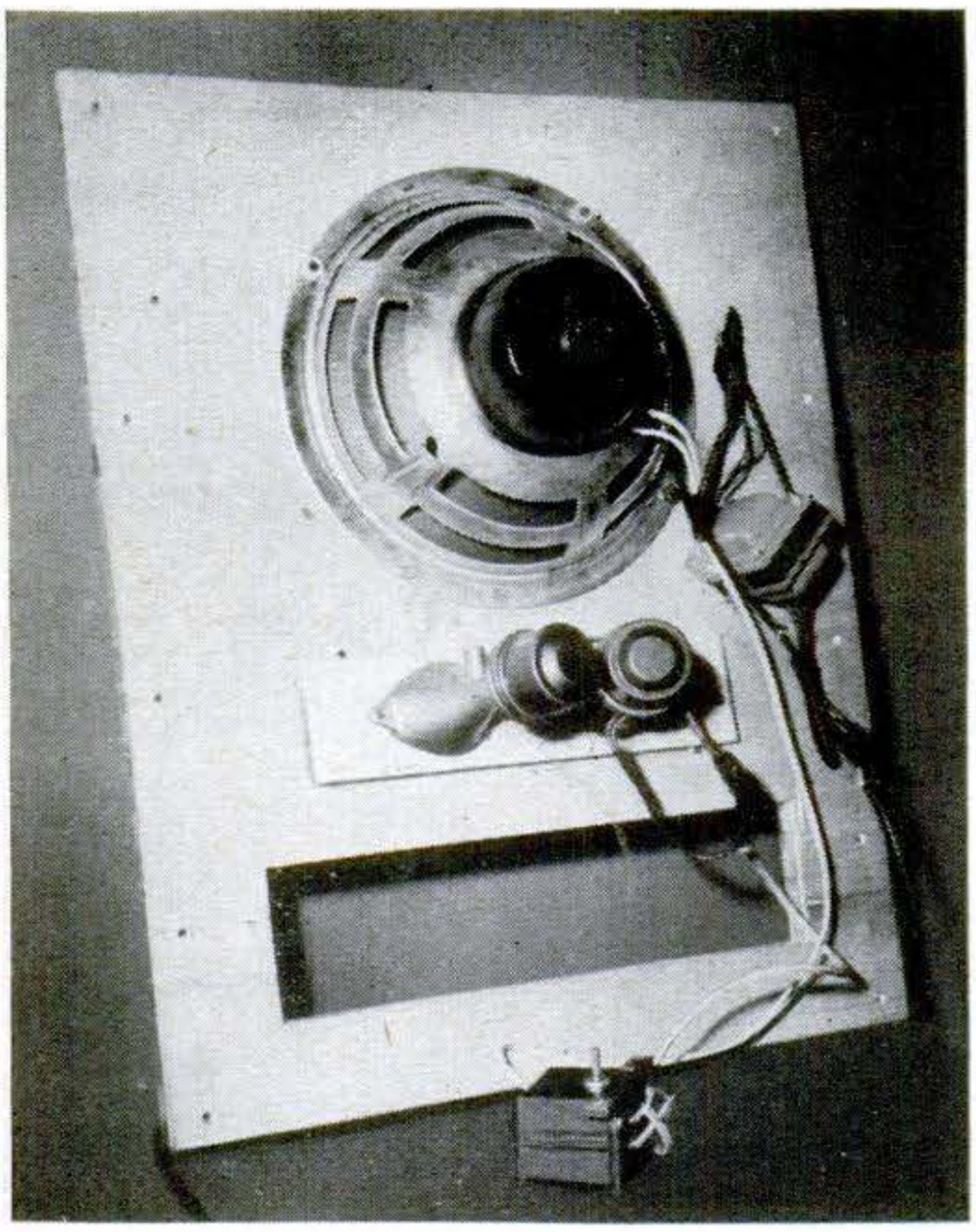
"Agreed," replied my wife. "Where do we start?"

"With the sound system. It's pretty good now, but we can make it better."

To explain why I wanted to begin with the sound, I have to tell you something about the parts of our helter-skelter collection.

First, there is our AM-FM radio and phonograph amplifier. It's an excellent job, capable of faithfully reproducing the full musical range from the rumble of the lowest bass drum to the airiest tinkle of the triangle. We'd bought the radio-amplifier chassis by itself and I had installed it in an old floor-model radio cabinet.

The bottom of the same cabinet held my loudspeaker system. I called it a "system" because it included a 12-inch speaker, a double-horn "tweeter," and a cross-over network. A large speaker can handle bass notes efficiently, but doesn't do as well with treble tones. The tweeter can handle the treble but not the bass. The job of the cross-over network was to separate music into its low and high frequency (bass and treble) components, and feed each to the proper horn.



Rear view of speaker mounting board shows the woofer (big speaker), tweeters, a new output transformer, and cross-over network.

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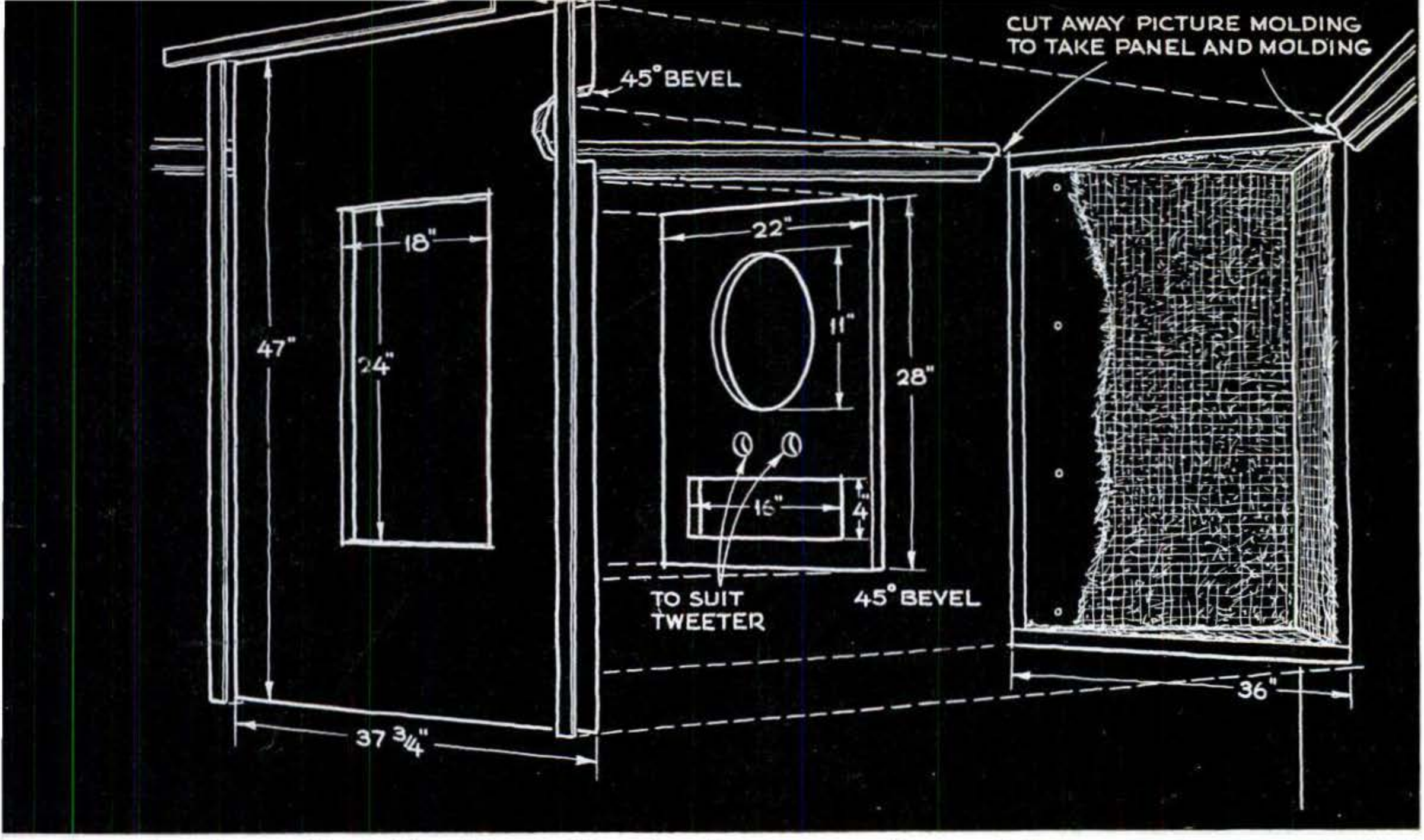

A reflex cabinet like this would make almost any radio sound better. Dimensions are for a 12-inch speaker. Total volume is over 8 cubic feet. We added the molding strips to conceal irregularities of the wall.

The sound that came out of the speakers was almost—but not quiet—perfect. Vibrant bass notes didn't have the full realism I could have wished for, and when we turned the volume up loud, sound filled the room but always seemed to be coming from one point—the loudspeaker.

Wait. I know—where did I expect it to come from? Well, I wanted sound to fill the room *without seeming to come from anywhere*. What's more, I knew how this could be achieved. A reflex speaker cabinet mounted high in one corner of a room has the effect of diffusing sound and giving bass notes richness without juke-box boominess.

To keep up my end of the bargain, I dug into a few textbooks and finally handed Jane this list:

Requirements for the Speaker

1. Size: A cabinet for a 12-inch speaker needs a *minimum* volume of 6 cubic feet. Make it larger if you can.

2. Material: The box has to be solid. If it's flimsy, the boards may vibrate and cause distortion. Figure on lumber at least ¾" thick. Also, the box has to be lined with sound-absorbing material. We can use that old rug cushion in the basement.

3. Location: If possible, make the cabinet face the longest dimension of the room.

4. Construction: A triangular cabinet has the advantage over a rectangular one of having fewer parallel surfaces. This minimizes false resonance caused by wall-to-wall reflection inside the box.

At the bottom of the sheet I drew a sketch of the speaker-mounting board, showing position and size of the openings that would be needed.

On the strength of points 3 and 4, Jane decided to angle the box in a corner of the room. First she scaled a couple of sketches. Then she produced some large grocery cartons and supervised while I made a cardboard mock-up. At her direction I whittled a little here and there until she declared herself satisfied with the proportions. We then rounded off the dimensions and drew up plans for the 8-cubic-foot box you see.

I used ¾" plywood, glued and screwed the sides, top, and bottom together, and fitted the front. Since we own our own home, I mounted the box by screwing the sides to the wall studs. I cut away the molding trim that runs around the ceiling so the cabinet would fit flush. We then sliced up

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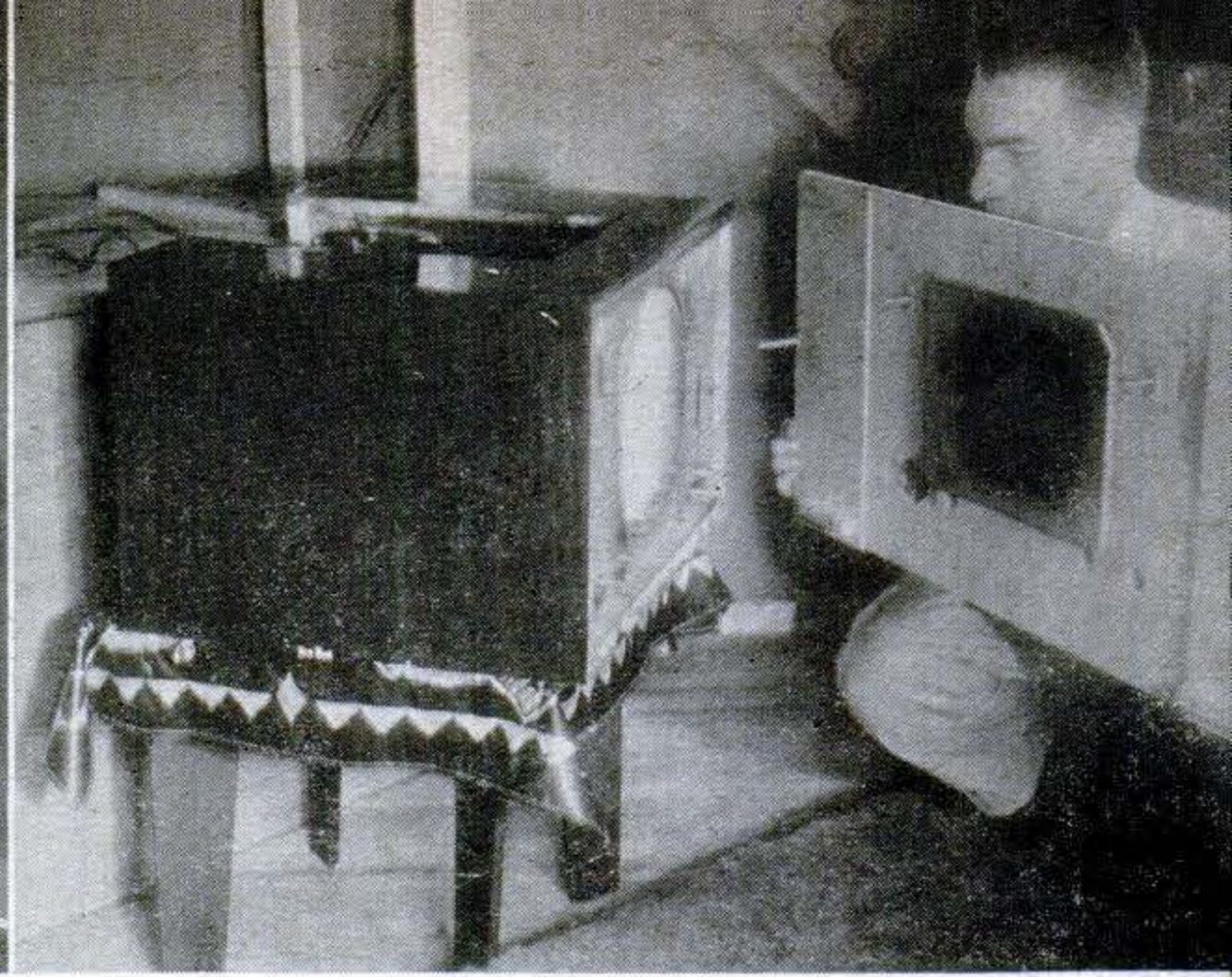
Double-hinged folding doors conceal two record players and a record-storage shelf. The players ride in and out on ball-bearing slides.



I removed the front from the original TV cabinet and mounted it intact on the new panel. I used the original brackets to hold it in place.

the rug cushion and used it to double-line the interior.

After we got the front panel screwed on we noticed several tiny gaps between the straight edges of the lumber and the irregular contour of our walls. We concealed the gaps by tacking 1″ strips along the edges.

Jane was almost as delighted as I was with the result. She readily admitted that she had never heard a radio sound so clear, warm, and lifelike.

But she also pointed out with some justice that she had been shortchanged in the deal. Instead of reducing the jumble of cabinets, we had so far only succeeded in adding an extra one.

"Okay," I said soothingly. "Let's get on with the job."

We then turned our attention to the television cabinet. "Here's what you have to allow for," I told her as I handed her this list:

Requirements for Television

1. Location: The TV screen should be placed to allow the widest viewing angle. There has to be ample seating space in front, and the arrangement mustn't obstruct doors or passages. Windows should be behind the viewer, not behind the screen.

2. Size: The cabinet should make allowance for future replacement with a color receiver or one with a larger screen. New sets are getting shorter and narrower, so figure the width and depth of our set, but allow several inches more in height. The screen should be slightly above the eye level of a seated person, that is, 35 to 40 inches from the floor.

3. Space utilization: An eye-level TV console has a lot of space that isn't needed for the chassis. I think we need a shelf for record albums (at least 13 inches high). We might use the rest for the radio or record-player, or both. I suggest that we buy Dick an automatic player for 45-r.p.m. records. These players are easy to operate and almost foolproof. [Dick, our five-year-old, had already ruined two expensive permanent needles by slamming them down on his records.] If he had one, we could ask him to leave ours alone.

4. Accessibility: TV sets do break down and no serviceman likes to stand on his head to get at the chassis. Make sure all units are easily removable.

5. Ventilation: The chassis gets hot in operation, so have space and vents for air circulation.

For some time Jane regarded the list pensively. Once she suggested that I had made up some of the points just to spite her. But we let that slide.

The first requirement seemed to point to the corner under the speaker cabinet as the logical place in our room. We stood the TV set in the corner and drew a line straight across. It measured 64 inches. That seemed much too big. We felt the screen would be lost in the middle of a panel that long.

Jane did a lot of figuring, and I made a lot of cardboard mock-ups, but everything looked too big, dominating the room by its sheer massiveness.

Finally she had two inspirations. The first was to run the front of the cabinet part way across the corner (40 inches, to be exact) and then break the ends in toward the

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The original TV speaker isn't needed in our new setup. I removed the speaker and the board on which it was mounted to improve ventilation.

The TV set just slides into its shelf. Two headless bolts are threaded part way into the panel. They're held by wing nuts on the inside.

walls. The photos show what I mean.

Her second idea concerned decoration rather than actual construction. It was to paint the speaker cabinet to match the walls. Thus the whole assembly would seem to fade back into the corner.

With this much settled, the rest was fairly clear sailing. She proportioned the doors and shelves to accommodate two record changers and an ample stack of records, and decided that she wanted the unit faced with a blond, natural-finish veneer (the actual choice was a burled birch). She also proposed that we retain the entire front of the old cabinet as a mask for the picture tube.

From her plans I made up working drawings and figured out the amount of lumber I would need. "I hope the veneers match," I remarked, as I completed the list of materials.

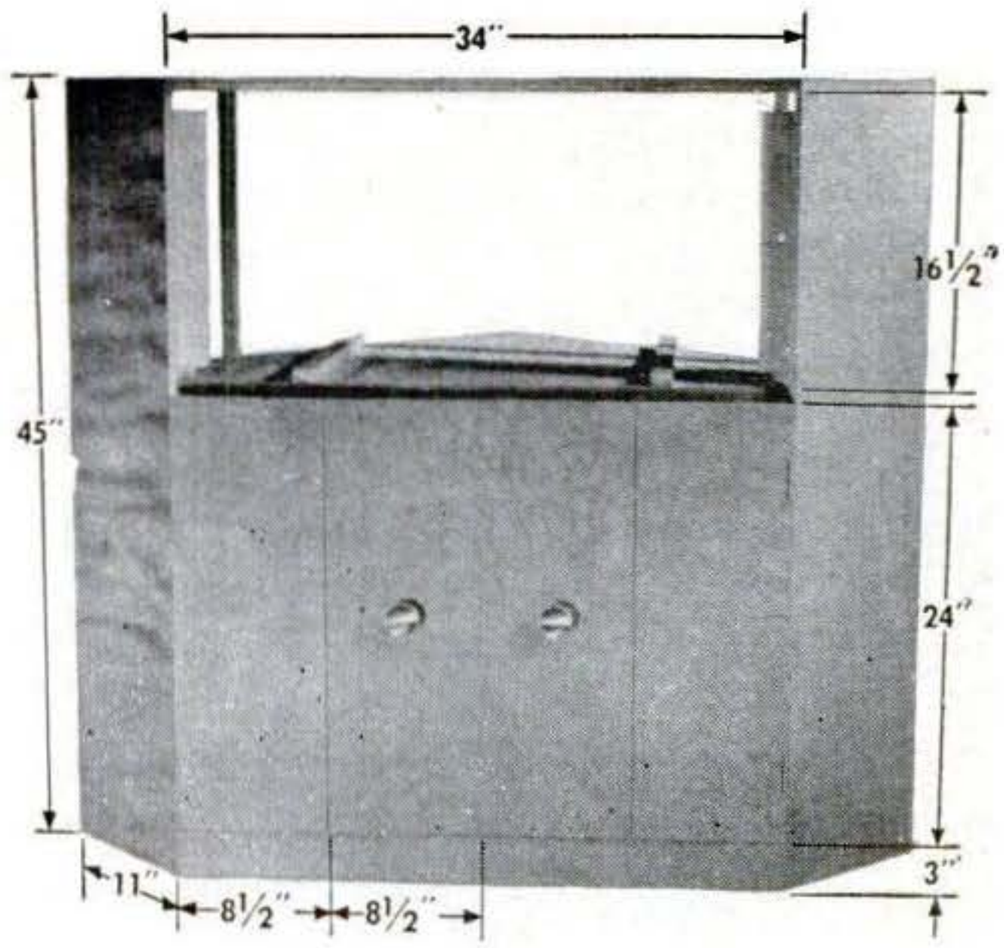
"You hope!" Jane exploded. "You go down to the lumber yard and tell them you want to pick out the pieces."

I laughed a tolerant, husbandly laugh. "You can't do that," I explained. "They're not going to waste a day selling me a couple of pieces of plywood."

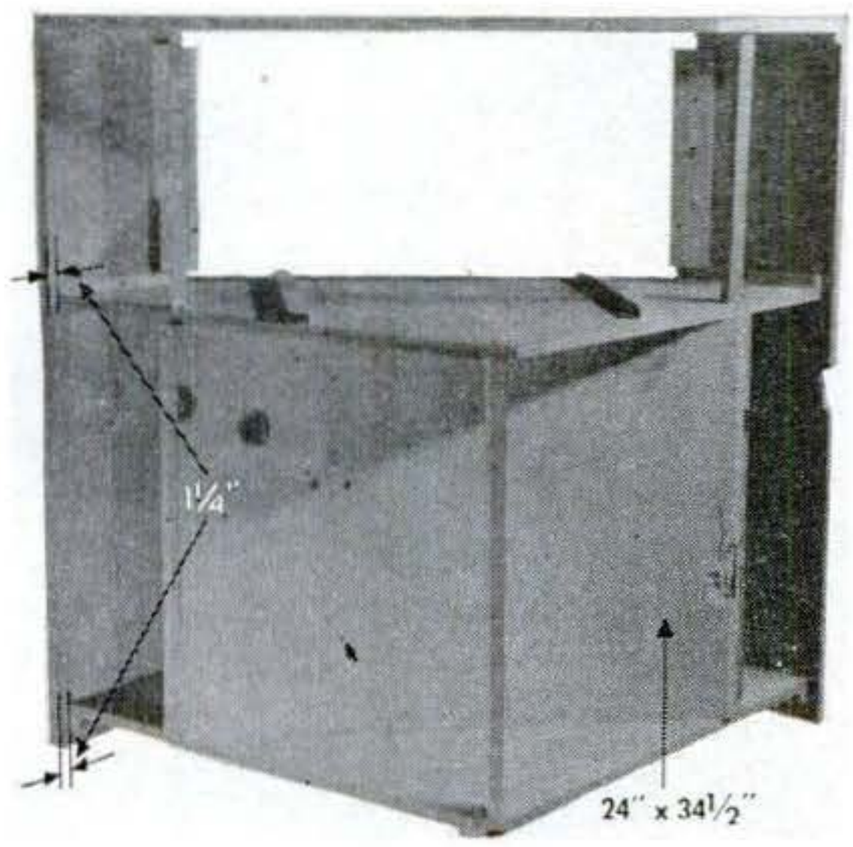
But I went anyway. I expected the salesman to give me the fish eye and a couple of cracks about guys who don't know what they want. Instead I found them patient and very helpful. They seemed to expect me to examine each panel and pulled out a great many for me to choose from.

I've been building things most of my life but it had never occurred to me to select my own lumber. Jane took it as a matter of course. How do women know these things?

One other point about our installation is



FRONT VIEW



REAR VIEW

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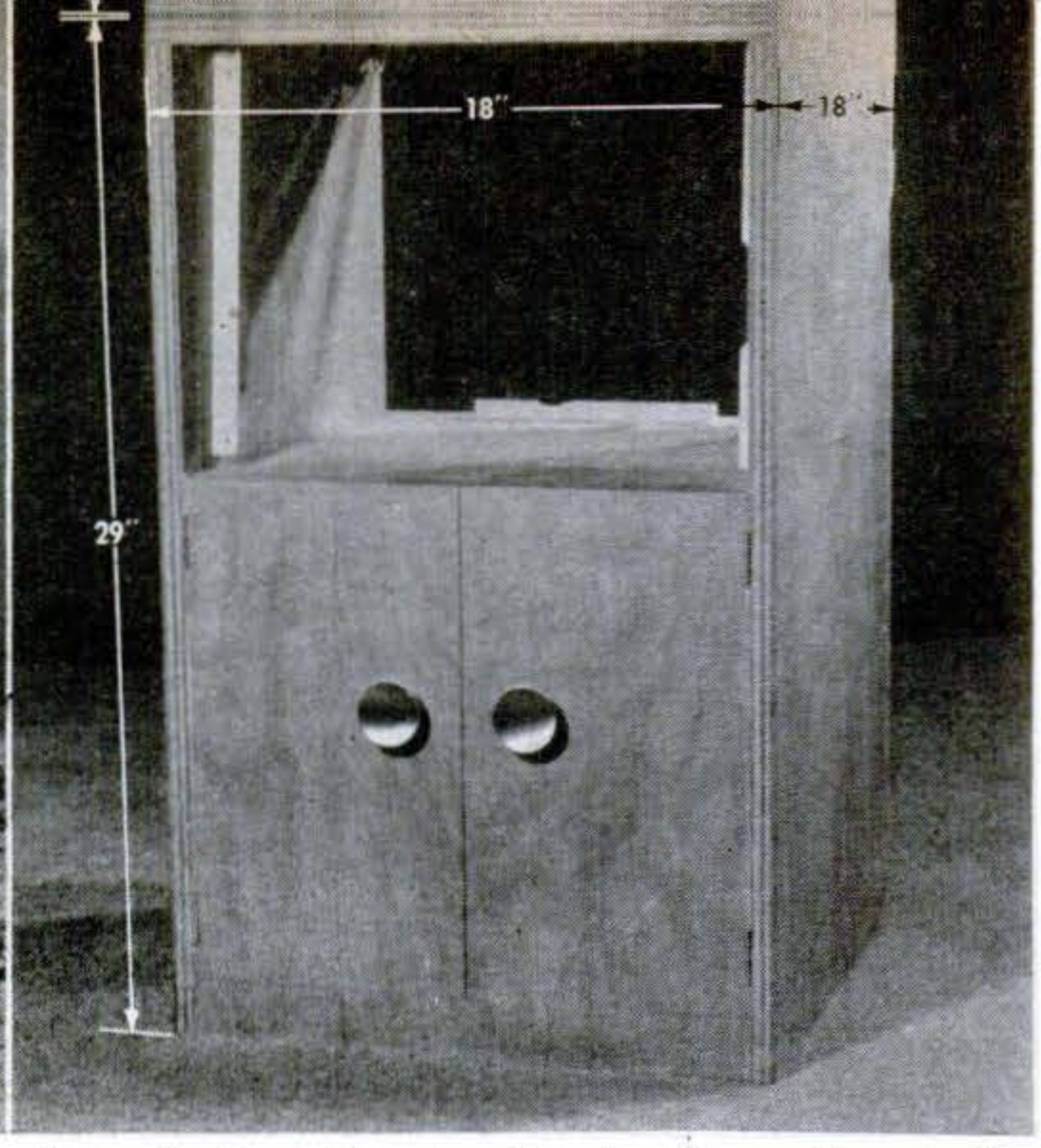
The on-off switch, volume, tone, and selector knobs on this panel control all the units in the combination. Cabinet below is for storage.



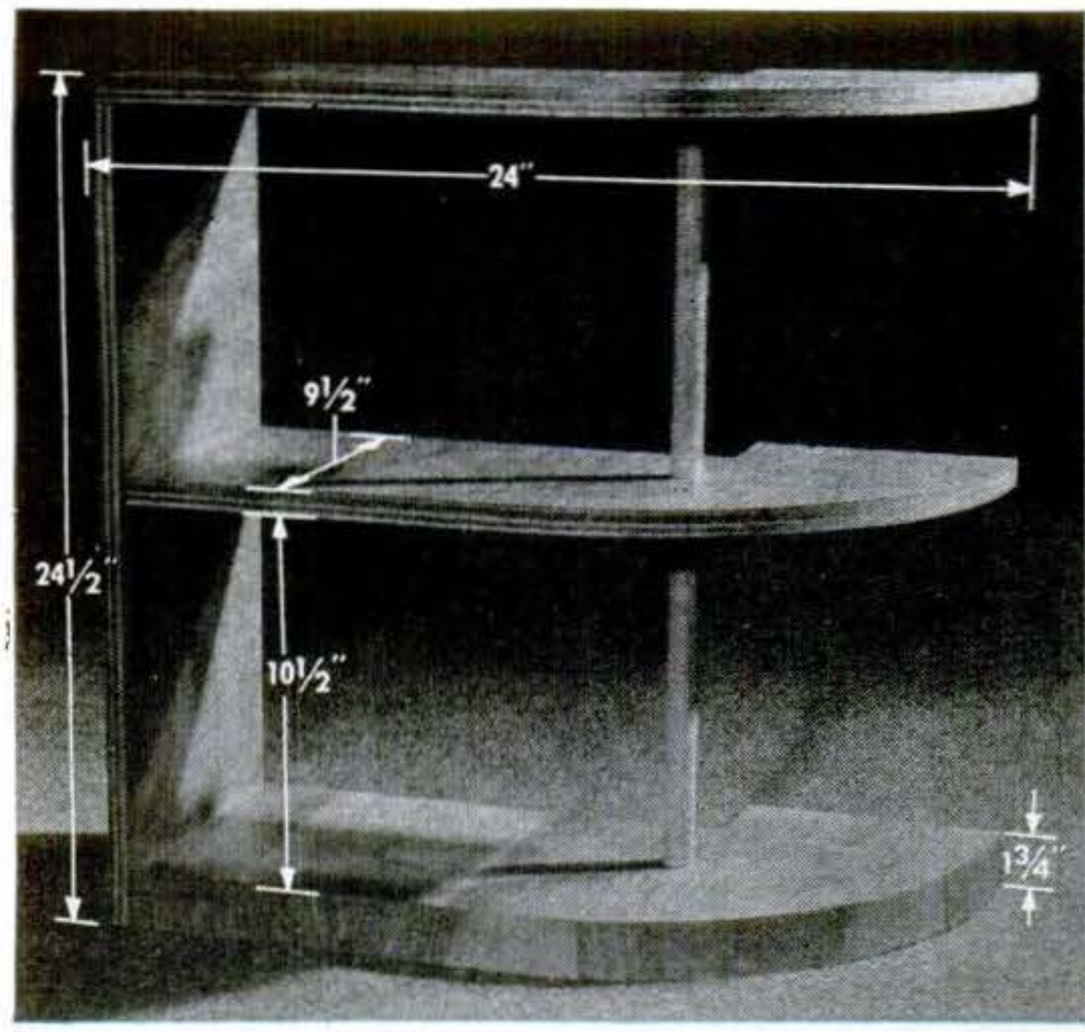
I tacked strips to the inside walls of the radio compartment to act as stops for the plastic panel. No other attachment was needed.

worth mentioning. Our excellent radio-phonograph and loudspeakers had spoiled my ear for TV sound. It's no secret that video receivers, especially table models, put most of their emphasis on picture. By contrast with our radio, television sounded tinny and thin.

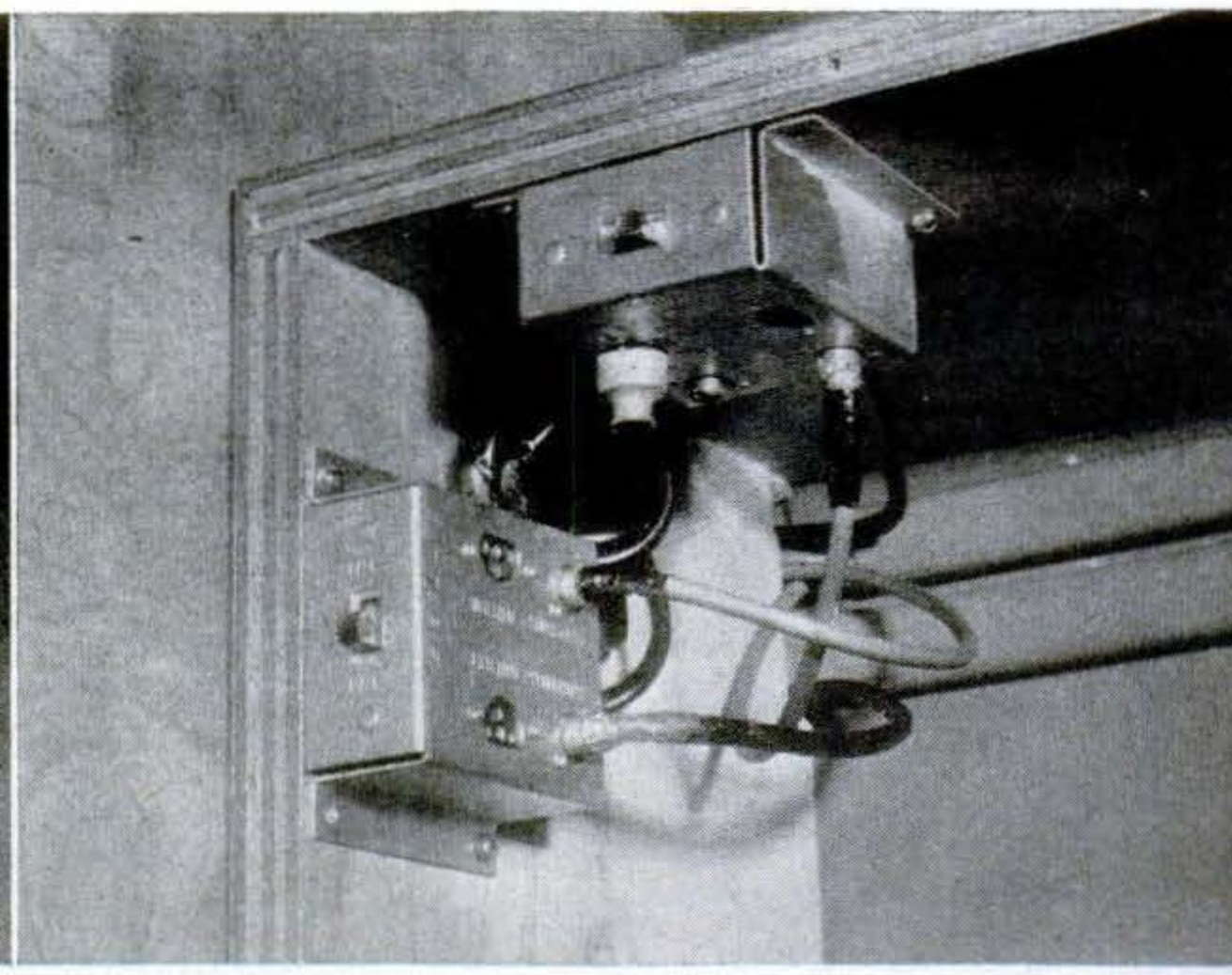
So I called in the service company that maintains my TV set. They connected its sound output to play through the good amplifier. The job was inexpensive, and did not affect our service policy. But it made a great difference in our enjoyment of TV.

After the strenuous effort that went into the television cabinet, I'm tempted to refer to the three remaining pieces as "incidentals." But they're not incidental at all. Jane insists that the radio cabinet and two bookcases tie the corner together. By balancing off the large center unit, they make it look smaller than it really is.

At first we thought of placing the radio close up against the TV cabinet. Jane nixed that idea. Then it occurred to me that since all the sound controls are on the radio panel, it would be nice to have them at your elbow as you sat at viewing distance from the screen.



This rounded-end bookcase serves as an end-piece along one wall. The wall has a setback near the staircase, so I notched the shelves to fit.



Two phono-selector switches connect the TV receiver and record players to the amplifier. Plugs permit easy removal of any unit.

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Jane agreed. I'm glad she did, because I have since discovered how convenient this arrangement is. When I'm watching a fight or some other TV show that doesn't need sound, I can switch off the announcer and tune in some pleasant background music without stirring from my seat.

I had very little planning to do in connection with these three pieces. They practically dimensioned themselves. I cut out a plastic front panel for the radio and then just measured the chassis. Keeping the controls on one panel presented a bit of a wiring problem. As I mentioned before, we wanted each separate unit in the combination to be easily accessible for servicing. Accordingly, I made sure that the wires running between the units were readily detachable.

Plugs and Sockets Connect the Units

In a job like this there are two types of wires to worry about: the 115-volt power leads, and the sound-output wires that go to the amplifier. Each unit has its own on-off switch, but I wanted to be able to turn off all power at one point. This isn't just a convenience; it's a safety feature. When the pilot light is off I know that there's no power in any part of the setup.

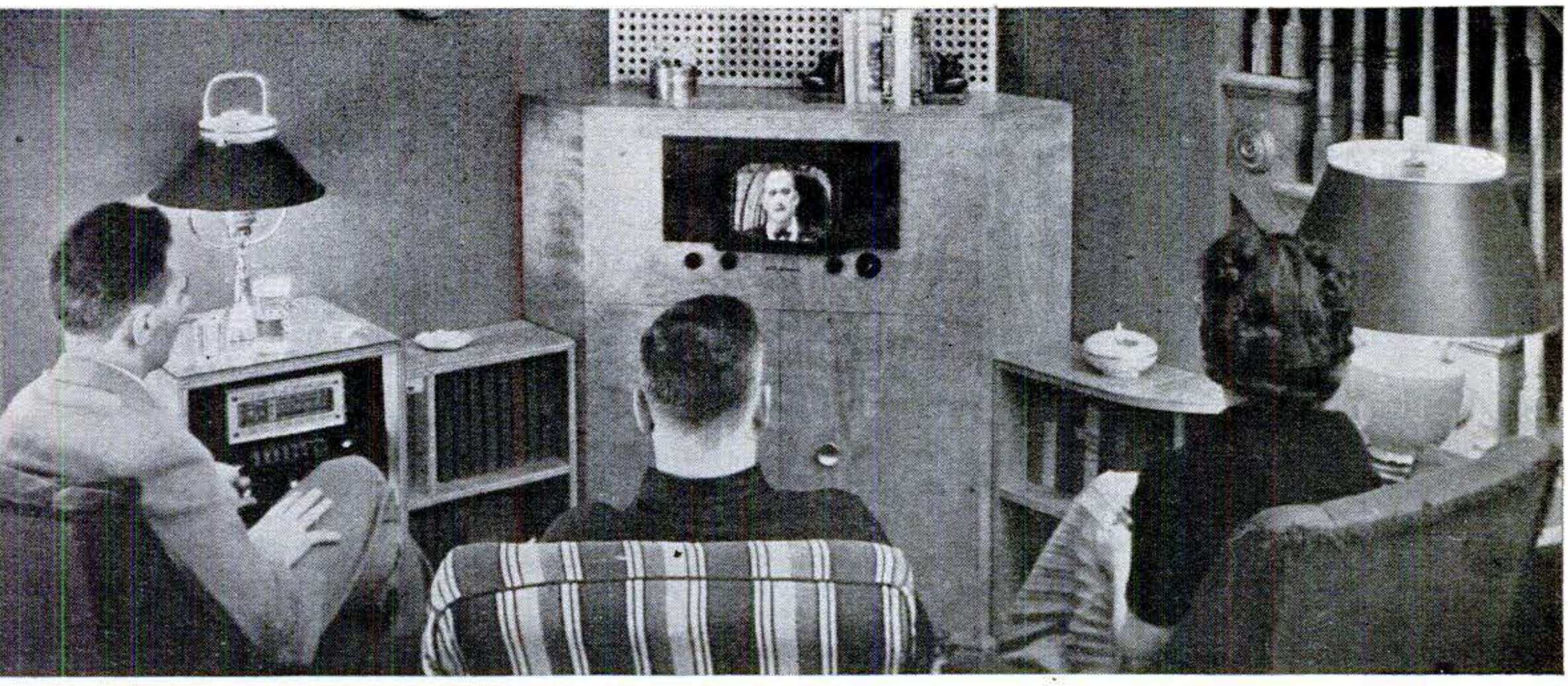
Like most good radio-phonographs, mine has a feed-through power socket mounted on one edge of the chassis. This socket is controlled by the switch in front, and is put there to provide an outlet for the phonograph motor. I plugged a multiple outlet into this socket and wired the two record changers and the TV set to the outlet. Switching off the radio automatically turns off the other units. Since the connections are made with standard plugs, there's no difficulty about separating the pieces.

Sound-output wires are handled similarly. Again, like most standard radio-phonographs mine has a selector switch on the front panel. The switch has three positions, one each for AM, FM, and phonograph. A phono-input jack on the chassis is linked to the third switch position.

To make this one jack serve for three plugs, I purchased two record-player selector switches, wired one to the jack, and made the remaining connections to the switches. All connections are of the jack-and-plug type.

Before applying a finish to our cabinets, we gathered up a few leftover scraps of wood and experimented with several different stains. Our final choice—Jane's, I should say—was a light stain and several coats of wax. The stain darkened the wood very slightly and brought out the birch grain. We protected the stain with paste wax, rubbing each coat hard before applying the next.

There's one other thing I should probably mention. Jane won't know it until she reads this, but I designed a couple of extra inches into the width of the radio cabinet. It leaves just the right amount of space underneath for that tape recorder I've had my eye on for a long time. END



Men—and woman—not at work. We now take our entertainment in solid comfort. The seating arrangement was part of the plan. Power, tone, and volume controls are on the panel at the left; selector switches, in the bookcase next to the radio cabinet, are within easy reach.

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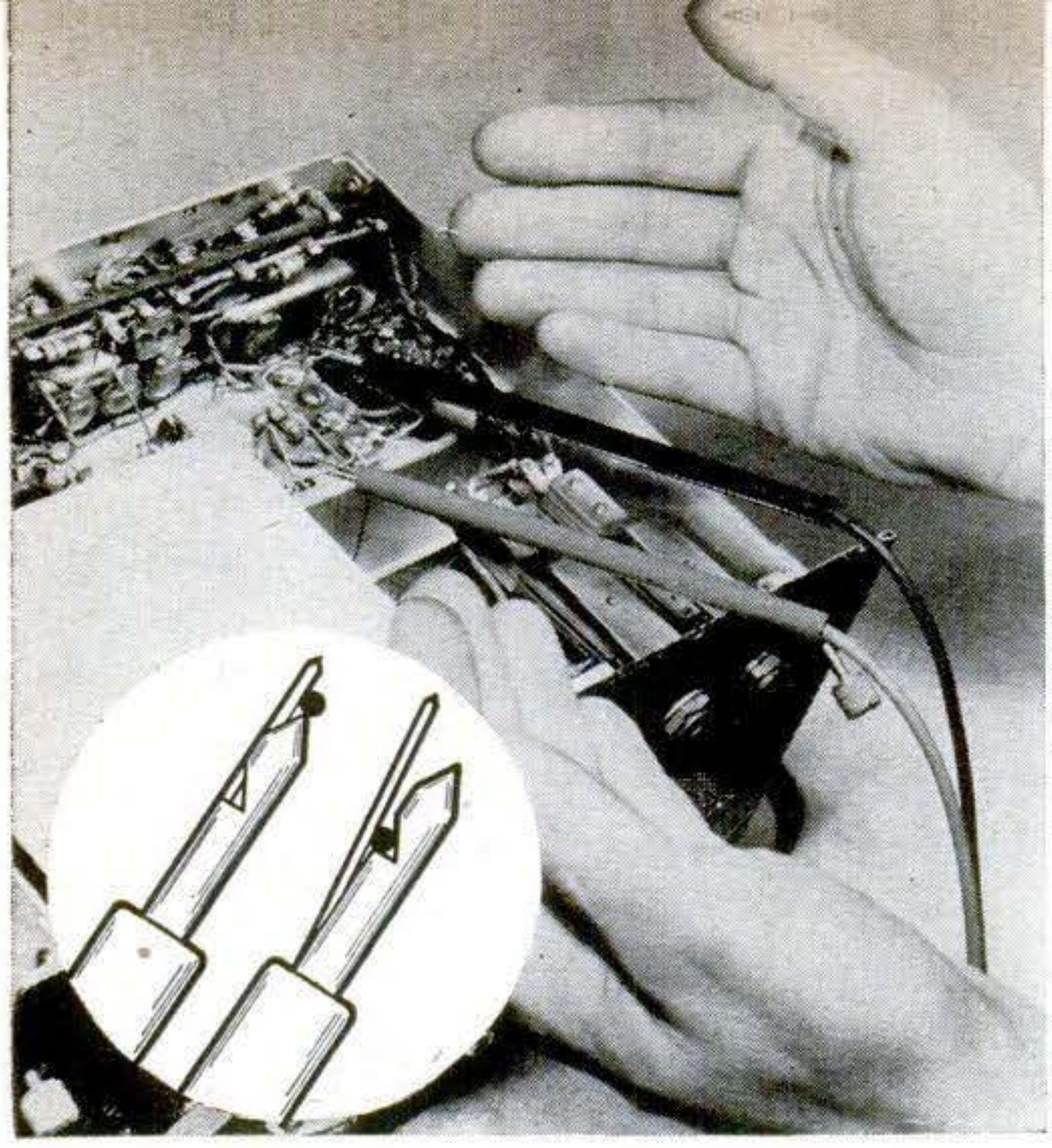
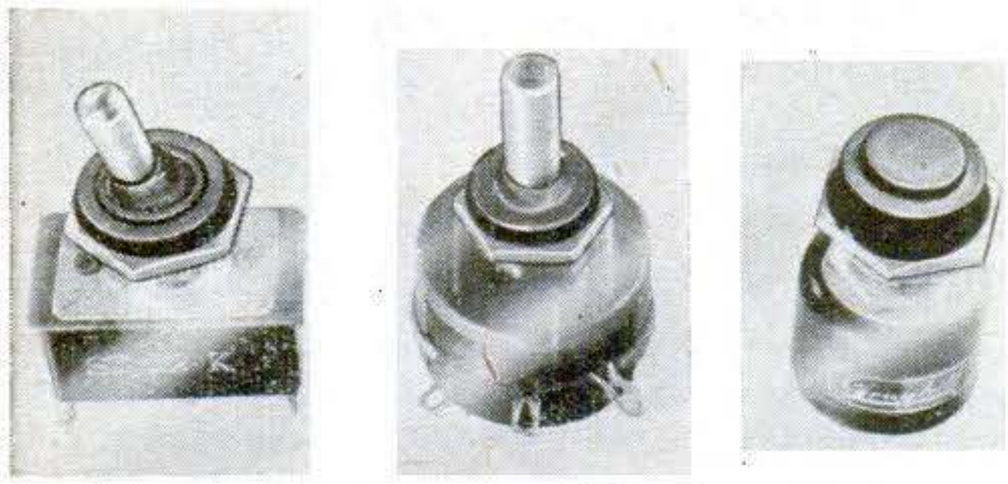


Test Prod Clips to Wire

TEST-PROD tips that take hold of wires free your hands for soldering or making servicing adjustments. The Klipzon prod, made by United Technical Laboratories, Morristown, N. J., has a steel needle that is spring-held against a notched tip. Pressing down on the prod forces the needle outward until it engages the wire, as shown in the inset. A pull releases the prod.



Nuts Waterproof Switch Shafts

LEAK-PROOF seals for switch and control shafts help keep moisture, dirt, and fumes out of electrical equipment. The waterproof assemblies above, called Sealnuts, are made in sizes to fit most shafts. Each unit consists of a neoprene cap and gasket and a nickel-plated brass nut. Sealnuts were developed by Radio Frequency Laboratories, Boonton, N. J., to meet Navy requirements.

Hummer Helps You to Sleep

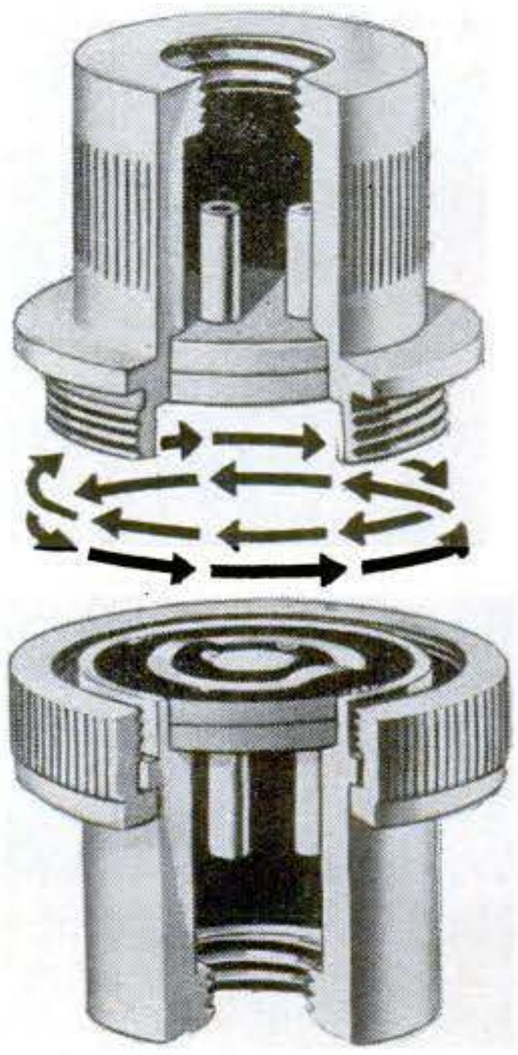
IS YOUR summer place too quiet at night? Some people find it hard to fall asleep without a lullaby of droning city noises. If you are one of these, a "sleep hummer" may help you catch up on your rest. This simple electric gadget produces a low-pitched, steady hum that tends to relax the mind and body.

To make one, mount a bell transformer, loudspeaker, volume control, condenser, and switch in a small box, and wire the parts as shown in the diagram. (The condenser can be a 30- 50-mfd. dual electrolytic with the two sections wired in parallel).

A sleep hummer may also be helpful in noisy places, for its soothing tone may serve to mask high-pitched, jangling sounds that might otherwise disturb your slumber.—*H. G. Eidson, Jr., Columbia, S. C.*

Rotating Electrical Connector

THIS swivel connector permits electrical fixtures to rotate any amount in either direction without tangling wires or interrupting the current flow. The swivel consists of two freely rotating halves joined by a threaded flange and collar. Phosphor-bronze contact rings maintain electrical connection. Robboy Electric Mfg. Co., Cleveland, makes 2-, 3-, and 4-wire swivels.



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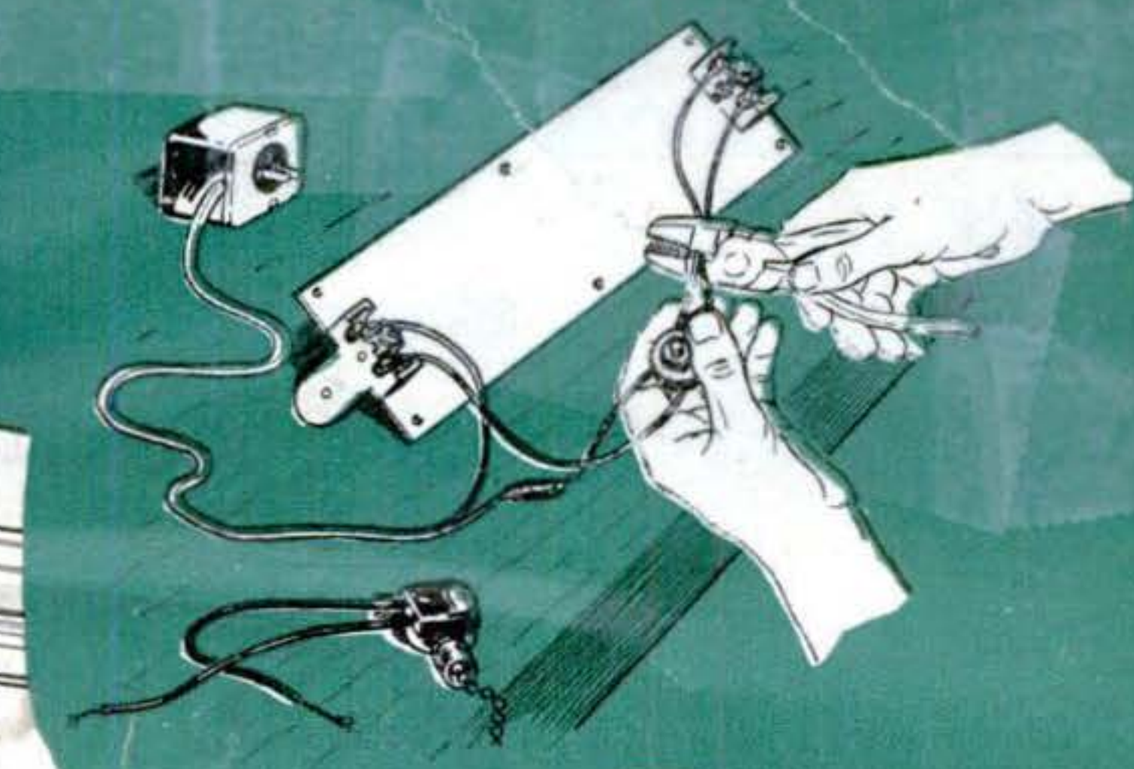
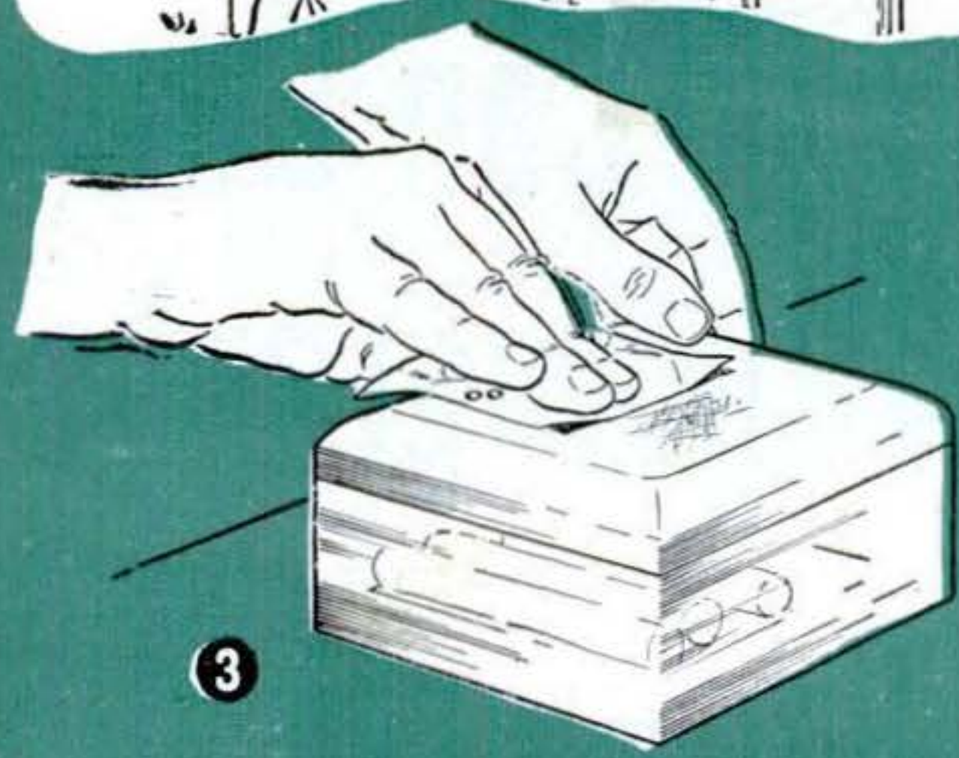
WHAT'S WRONG ?





A GOOD handyman knows some of the tricks of a lot of trades. But it's a rare fellow who knows all the tricks of all the trades. You can tell that each of the jobs above is being done by an amateur because a mistake is being made that a professional would avoid.

1. This isn't the best way to paper a wall, although it is often done.

2. When the control switch on this fluorescent went flooey, this fellow decided to cut it out and replace it with another switch.

3. A network of light scratches disfigured this plastic box. Here our fixit man is smoothing the lid, using fine 00 sandpaper, of course.

4. Many painters buy white paints and mix their own colors. It's cheaper that way, and they can match shades.

Answers

1. The lapped joint faces the wrong way. The man should lap the wallpaper *toward* the window. This would make the shadow of each lap joint less noticeable.

2. The switch being cut out of the lamp has four wires—two for the on-off circuit and two for the starter circuit. The regular SPST switch shown on the table cannot replace it.

3. Even fine sandpaper puts more scratches into plastic than it takes out. To remove small scratches, use toothpaste or other fine abrasive. Another way is to rub the plastic with very fine waterproof garnet paper, used wet. The light frosting that results can then be buffed off.

4. Colors-in-oil should not be added directly to the paint. The color should be dissolved in thinner, and then strained through cheesecloth. This keeps out undissolved spots of color and prevents streaking. Reds, blacks, and blues are particularly liable to form spots if not mixed properly. It's also a good idea to pour off half the paint and color each half separately. This makes it easier to correct the color if, by chance, you make it too dark.

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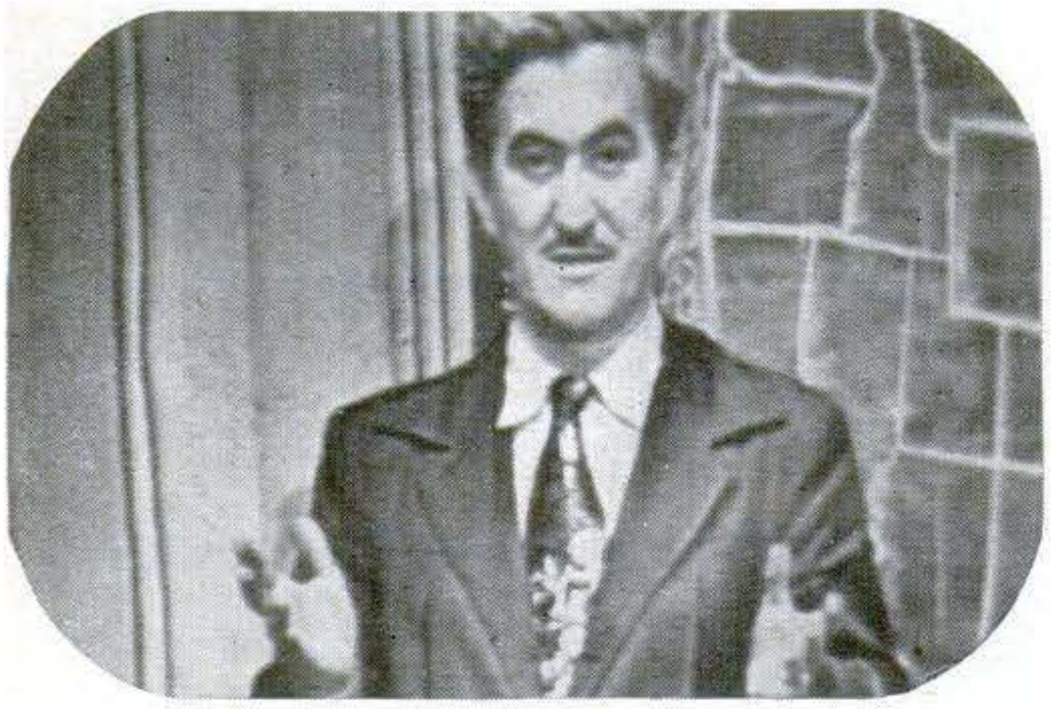
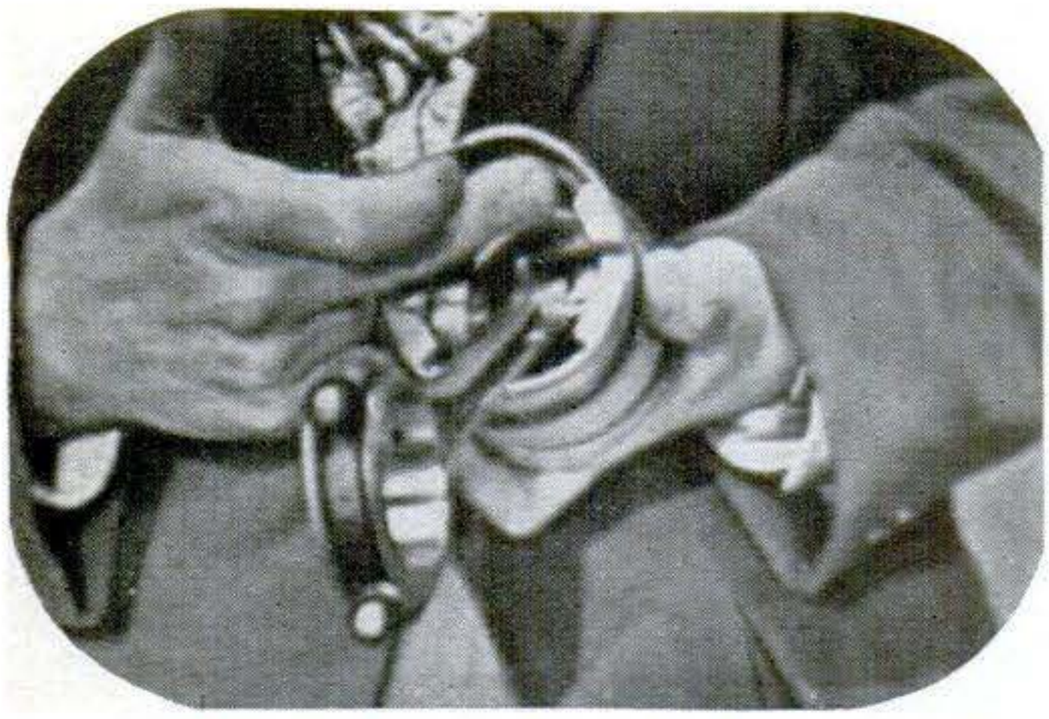
Singers Mimi Benzell, Earl Wrightson.

George McManus, cartoonist.



Dr. Roy K. Marshall explains . . .



. . . how a con rod and piston work.

TV's Images Can Be Photographed

PS photos by W. W. Morris

THERE'S a new hobby awaiting you these days—making a scrapbook of TV scenes. Sitting comfortably before a television set, you can snap photos of celebrities, sports events, and pin-up girls.

But to take such photos, you must

Lou Little, Columbia football coach.

Lynn Bari, Ken Murray, and TV pup.

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Actress Arlene Francis.

Careful timing gets sports shots, too.

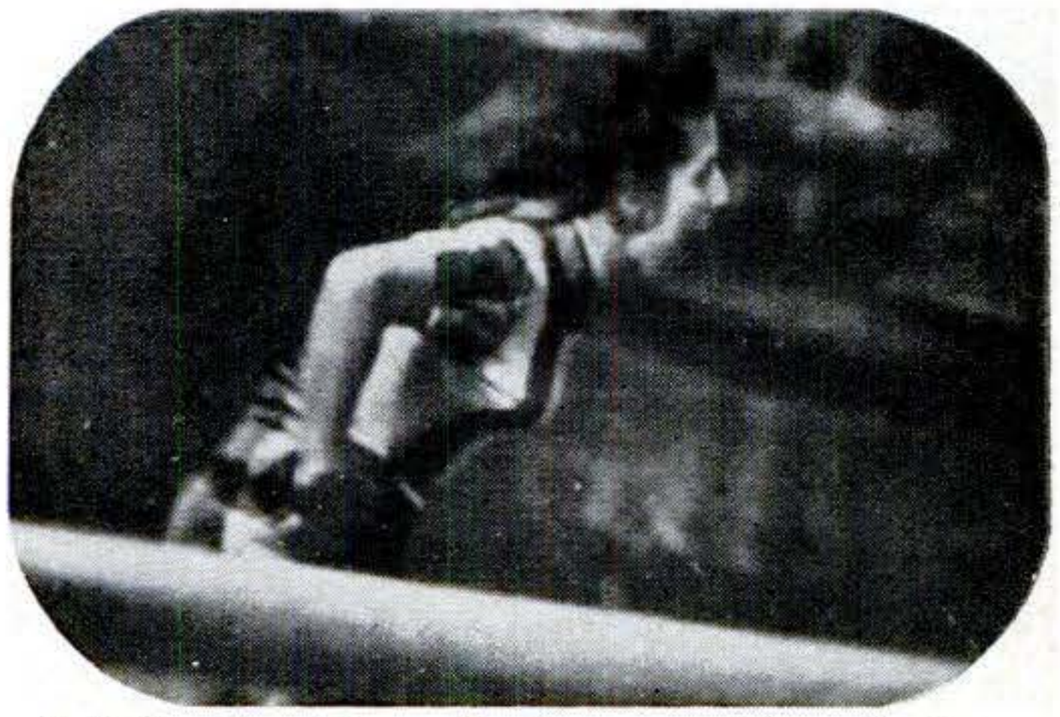
know the tricks. A simple box camera won't do. Nor can you point a flash gun—as some unthinking characters already have done—and wind up with anything but a photo of the set and a blank screen.

In TV photography you must work with the light from the screen itself. Since this isn't very intense, your shooting speeds have to be slow, anywhere between 1/5 and 1/25 second, and the lens must be opened wide, or almost so.

Even if the light were brighter, the nature of a television image would limit your top speed to 1/30 second. In a television tube, all the scanning lines forming a complete picture frame are repeated at the rate of 30 times a second. Any photo snapped at a speed faster than 1/30 second, therefore, would be only part of a picture—if you got anything at all.

You can use any camera with a ground-glass back that will focus down

Dave Garroway of "Garroway-at-Large."



A bit of action during a roller derby.

Arthur Godfrey and his famous uke.

Chorus scene from "Show of Shows."

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Focus on test pattern before program begins. TV photos on preceding pages were taken with Kodak Reflex II, right. A Chess United +2 portrait lens was used on its f/3.5 taking lens.

A piece of ground glass in the exact plane of the film, below, provides exact focus and framing if you use a folding camera. After focusing, load your film without moving camera.

to two feet or so. Lacking that, you can put a portrait attachment on a twin-reflex or folding camera. The object is to get close enough so the image of the television screen fills the negative. If there's a shiny metallic border around the screen, mask it with black tape. In some sets, this border is at an angle and may reflect enough light to weaken the contrast.

Set the camera on a sturdy tripod and focus on the test pattern before the program begins. Adjust the television image to normal contrast, that is, one with a full range of tones—the same sort of image you would want for viewing.

If you are using a twin-reflex or folding camera, remember to compensate for parallax while setting up the camera. Use Super XX or other very fast film.

All the accompanying television photos were taken on a 10-inch screen with one of two camera settings—either 1/10 second at f/4, or 1/25 second at f/3.5. If your camera has an f/4.5 lens, 1/10 second will probably be as fast as you can shoot.

At any speed, exact timing in snapping the shutter is essential. With the shutter cocked and your finger on the trigger, wait until your subject reaches the end of a sentence. Then shoot. In almost all cases, a speaker or singer will remain motionless at that point for a brief interval.

Develop your film a third longer than the usual time you would give it. This builds up the contrast and saves many negatives that otherwise would yield only the flattest of prints. If you take your film to a drugstore for processing, find one that will do this for you.

With television negatives, you can't expect extreme enlargements. But your best ones should easily blow up about three diameters if carefully handled. END

POPULAR SCIENCE *will pay for photos of images on your TV screen. Twenty-five dollars will be paid for the best one received before Sept. 30, 1950, $15 for the next best, $10 for the third best, and $5 for each additional one selected for publication. On the back of each photo, write the name of the TV station and program, the date and time of day you took the picture, exposure data, kind of camera used, and your name and address. Send negatives with all photos to TV Photo Editor, Popular Science, 353 Fourth Ave., New York 10, N. Y. Pictures and negatives cannot be returned, unless stamped and addressed envelopes are enclosed. The editors' selections will be final and will be based on subject matter and technical quality of the photos.*

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Twin-Image Cap Sharpens Photos

Fitted on viewing lens, cap shows two images on ground glass—until subject is in focus.

BY INSTALLING a simple, homemade accessory on a twin-lens reflex camera, you can focus it by merging two images—much as you would with a costly split-image rangefinder.

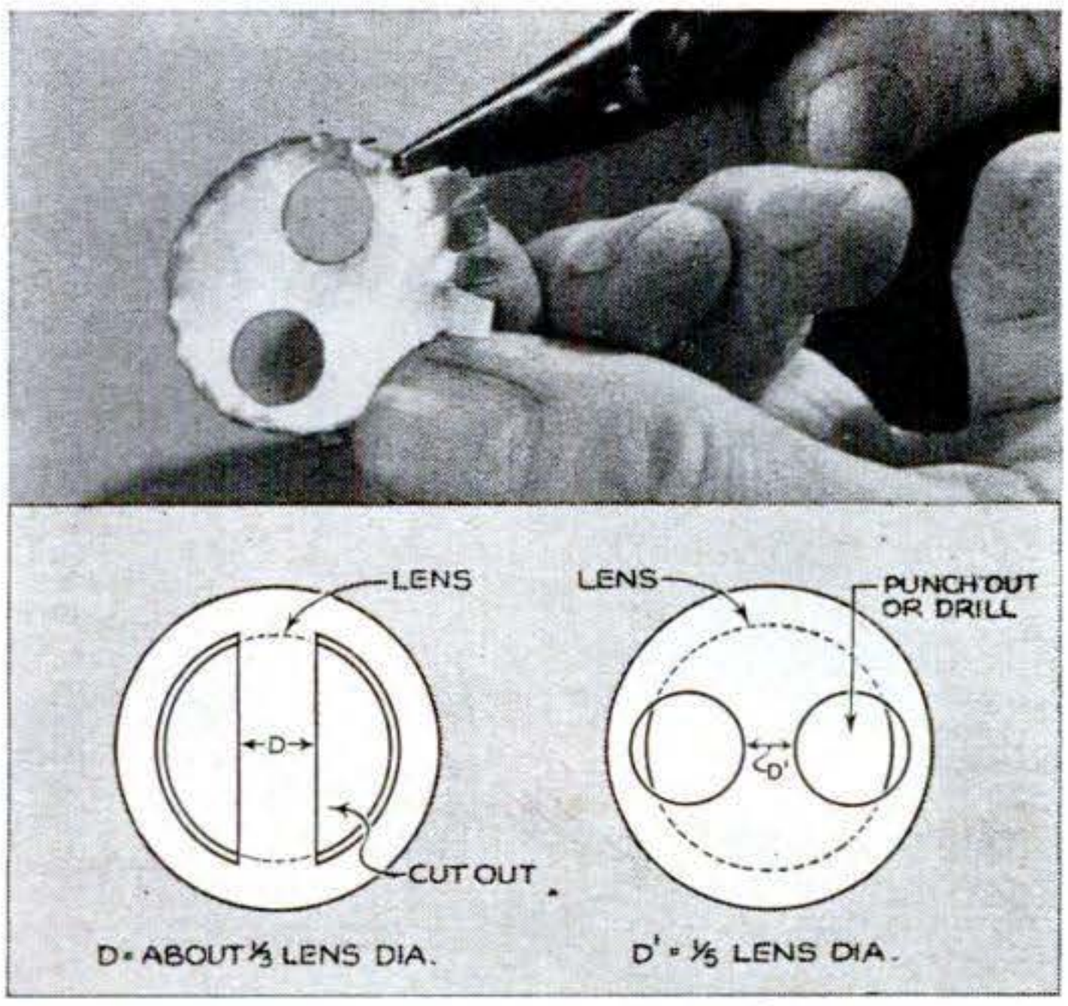
The accessory is a two-holed cap mounted on the focusing lens. While a subject is out of focus, the cap throws two overlapping images on the ground-glass viewer. When they merge, focus is perfect.

You can quickly test the cap's effect. Put a strip of opaque tape across the middle third of the focusing lens. This splits the light into two beams. When your camera is in focus, these two beams will converge into one—and you see a single image in your viewer. When it is out of focus, however, the beams converge ahead or behind the critical point, and you see two images.

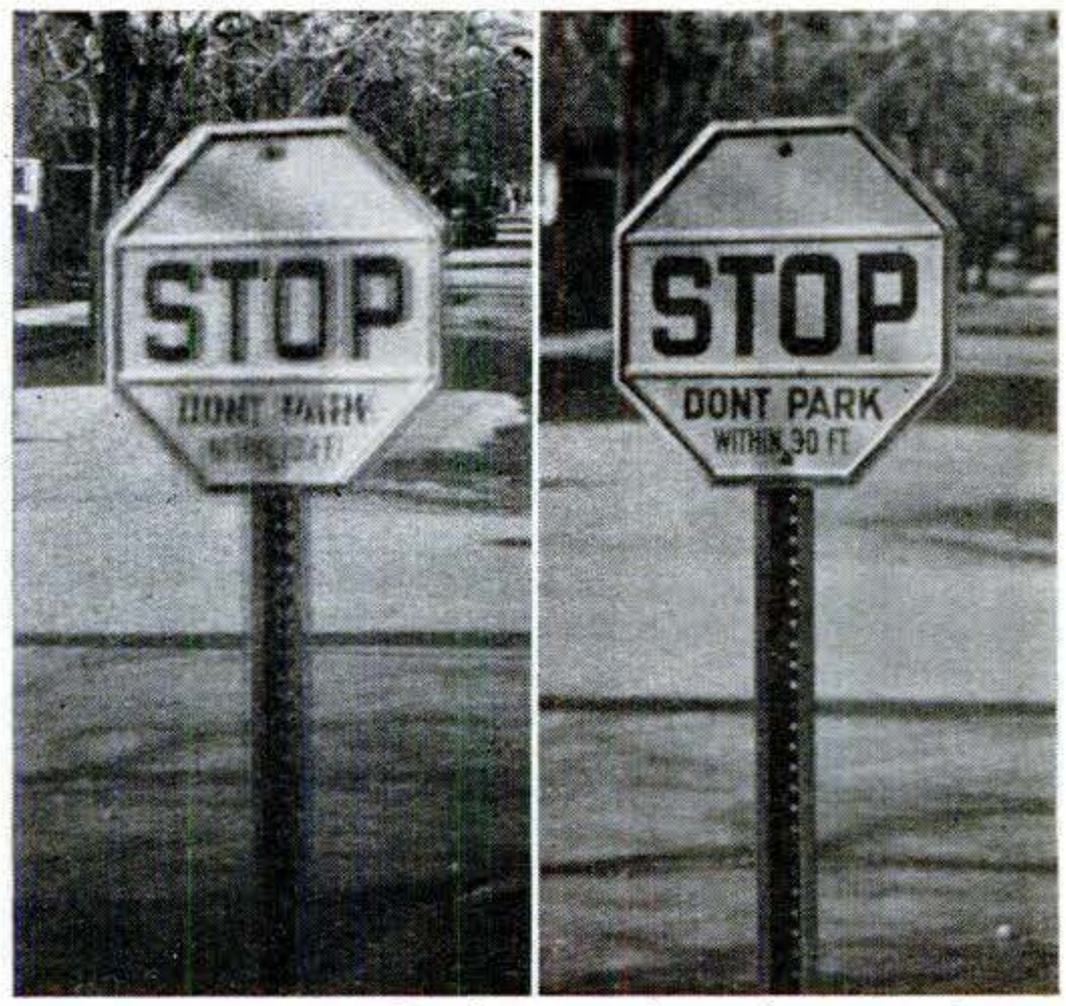
Photographers sometimes use the same trick to focus enlargements. For instance, a narrow strip of tin bent and clipped temporarily across the center of the enlarger lens produces a twin-image effect.

The cap shown in the photos was made by cutting a disk from thin aluminum and then notching and bending the edge. Felt cemented inside the rim prevents damage to the lens barrel. A thin glass disk cemented in the cap will keep dust from the lens. A piece of filter gelatin or colored glass over one of the openings will make one of the double images a different color.

It's best to place the cap so the images are seen side-by-side rather than one above the other. Focus on a vertical line.—*Walter E. Burton, Akron, Ohio.*



Half-moon openings are best because they pass more light, but drilled holes are easier to make. Cut edge as at top and crimp over lens.



What you see. If subject isn't in focus, it shows double lines, as at left. To focus, you move lens until lines merge as at the right.

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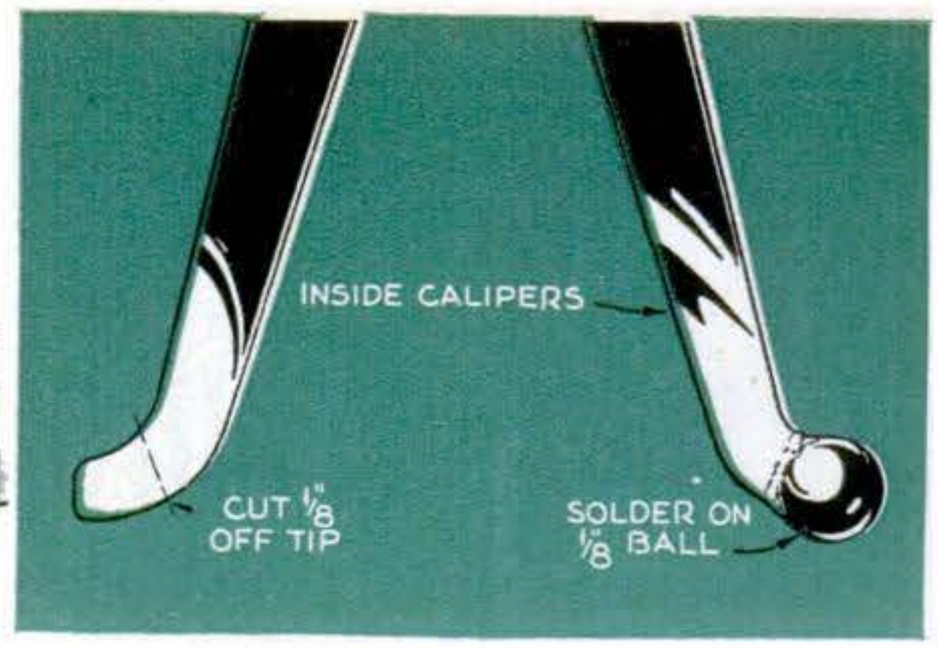
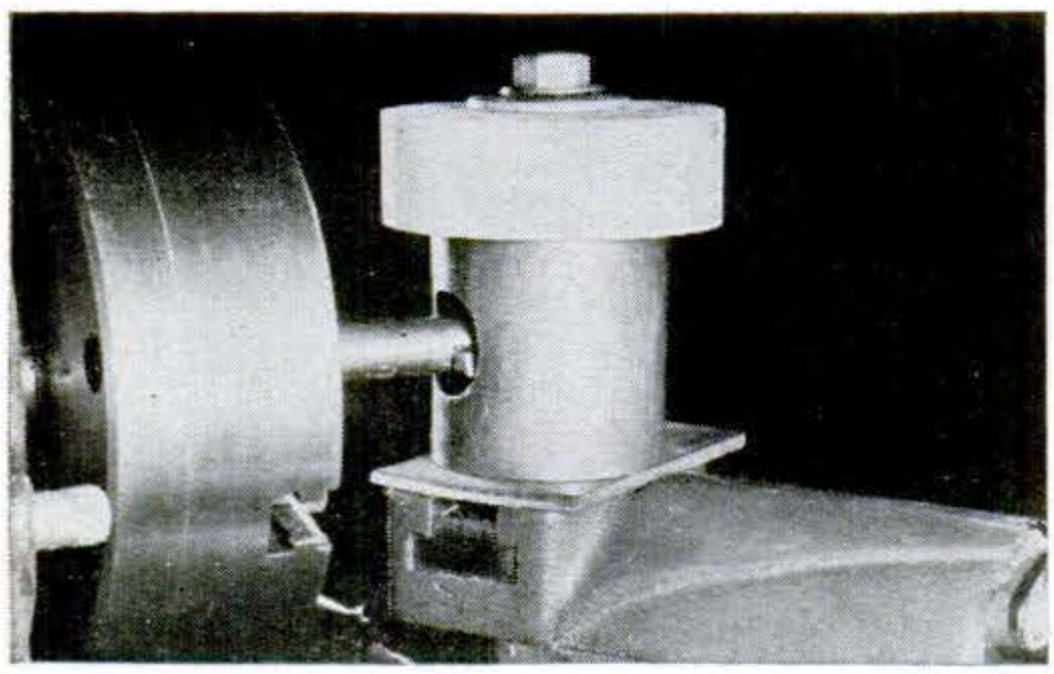
NEW SHOP IDEAS

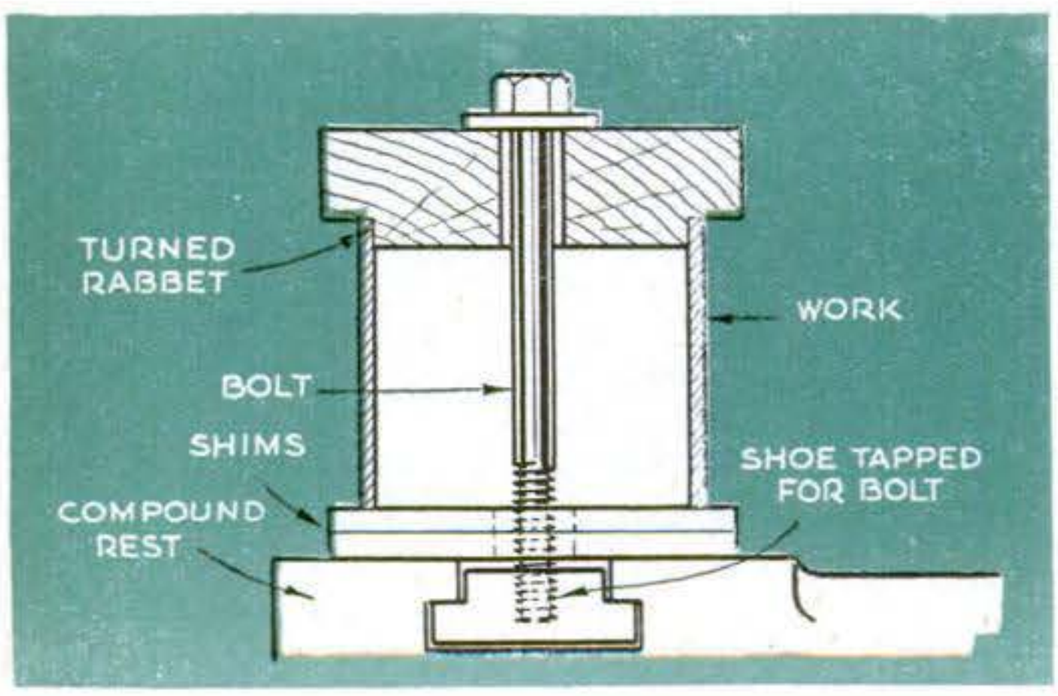


Ball Calipers. The flat ends of inexpensive inside calipers make it hard to get really accurate readings, especially in small bores. I cut a little from each tip and soldered on a ⅛" bearing ball, being as sparing of the solder as possible. Because of the true radius and high polish of the balls one can, after a little practice, measure within a thousandth of an inch.—*J. O. Devau, Derby Line, Vt.*

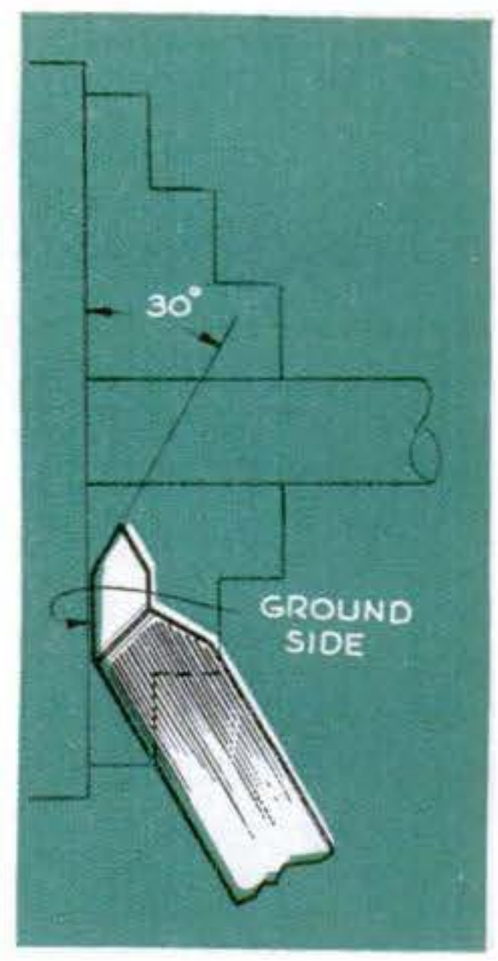


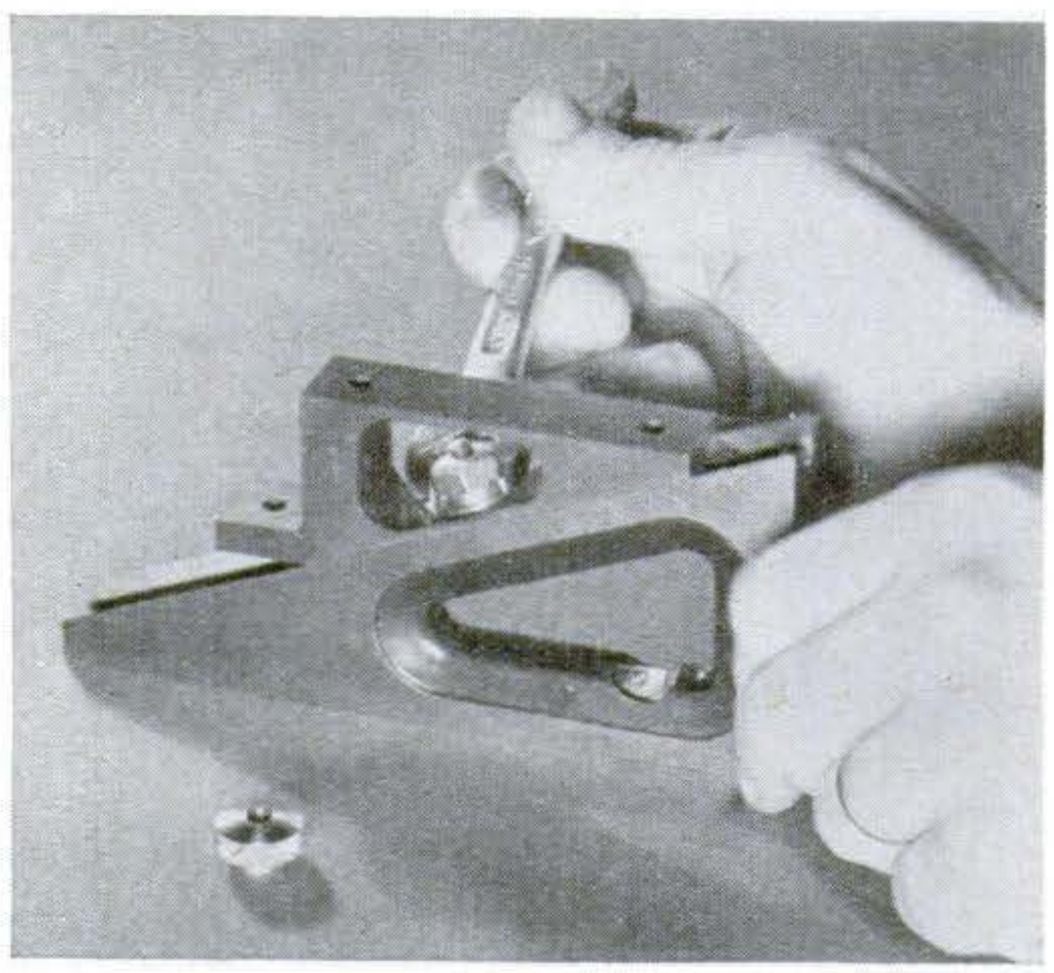
Lathe Bores Holes in Tube. Thin walls, a curved starting surface, and the difficulty of holding the job make it hard to get clean large holes in tubing. Here's a good way to do it in the lathe.

Chuck a piece of hardwood and turn a rabbet on it to fit inside the tube. Drill a center hole in the wood for a bolt. Then clamp the tube on the compound rest as shown, with shims if necessary to bring the hole center to lathe-center height. Drill a small pilot hole, open out with a larger drill, and finish with a boring tool as in the photo, adjusting the bit in the bar to bore the desired radius. Lock the gibs on both cross slide and compound to prevent chatter.—*Joseph Tracy, Manhattan, N. Y.*



Threading Tool Sets Itself. If you grind one side of a forged threading tool at an angle of 30° to the point, as shown, you won't need a threading gauge to set it up. Just clamp it with this side flat against the chuck face or faceplate, and the cutting point will be square to the axis of the work.—*J. B. King, USN, U.S.S. Wright.*





Locking Planer Gauge. When used for setting heavy sine plates, a planer gauge tended to slip its adjustment. To overcome this, a 7/16" hex nut was made up to replace the knurled clamp nut. Tightened with a wrench, the hex nut held securely.—*Henry Sevcik, Los Angeles.*

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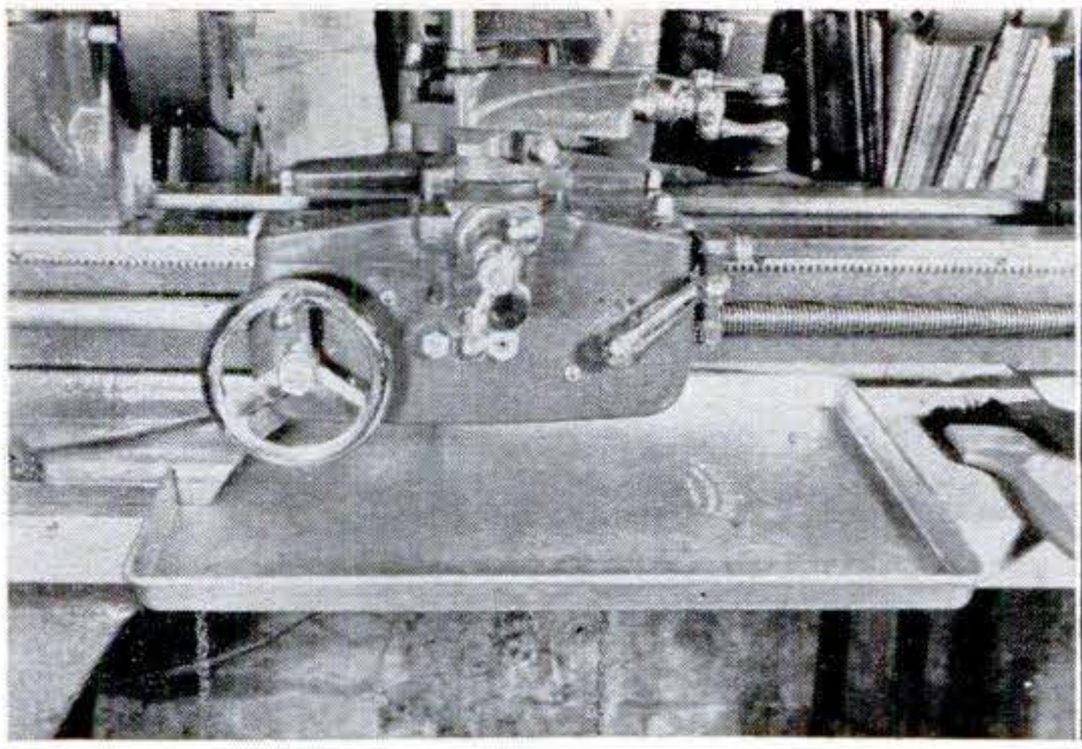
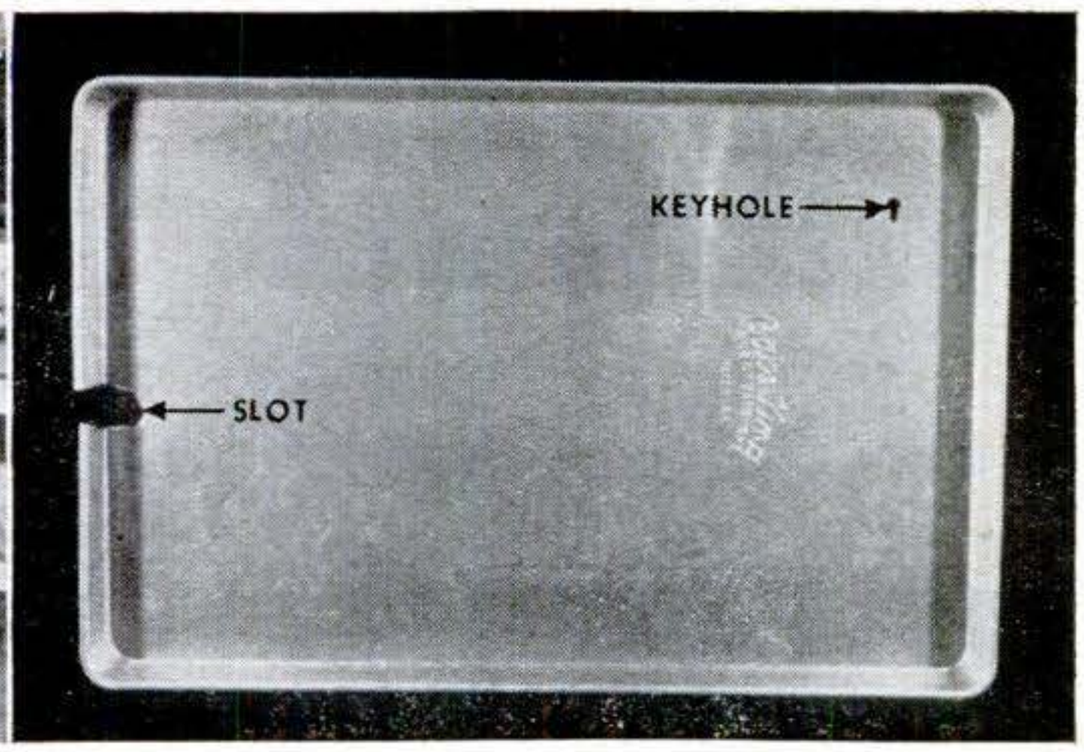
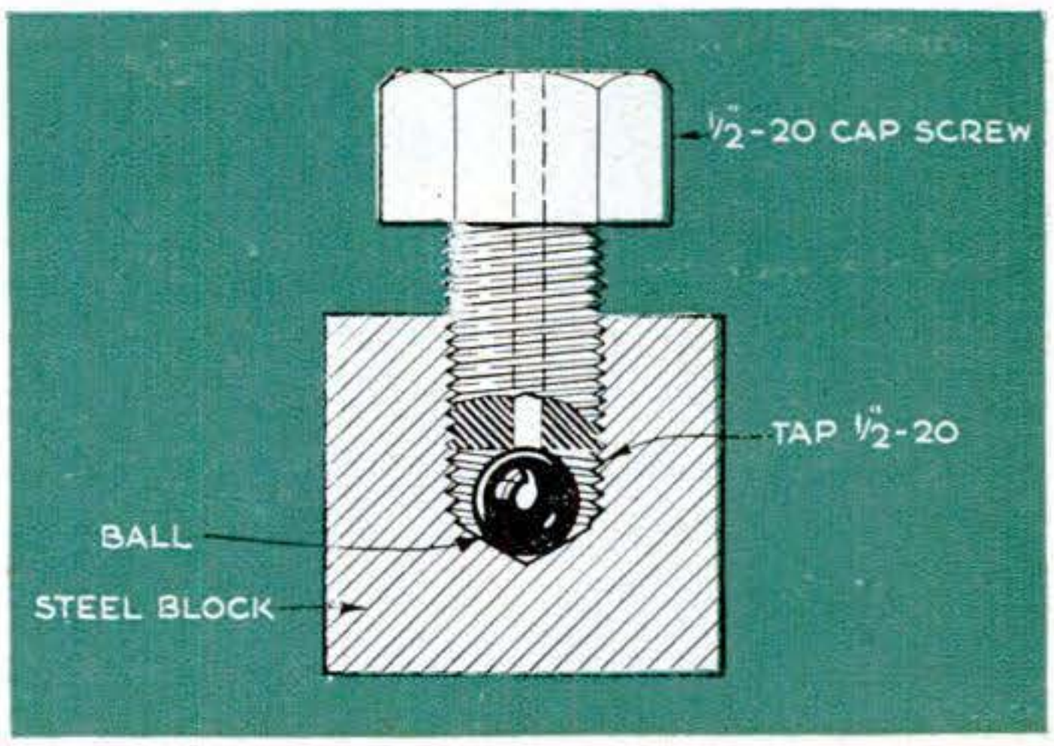


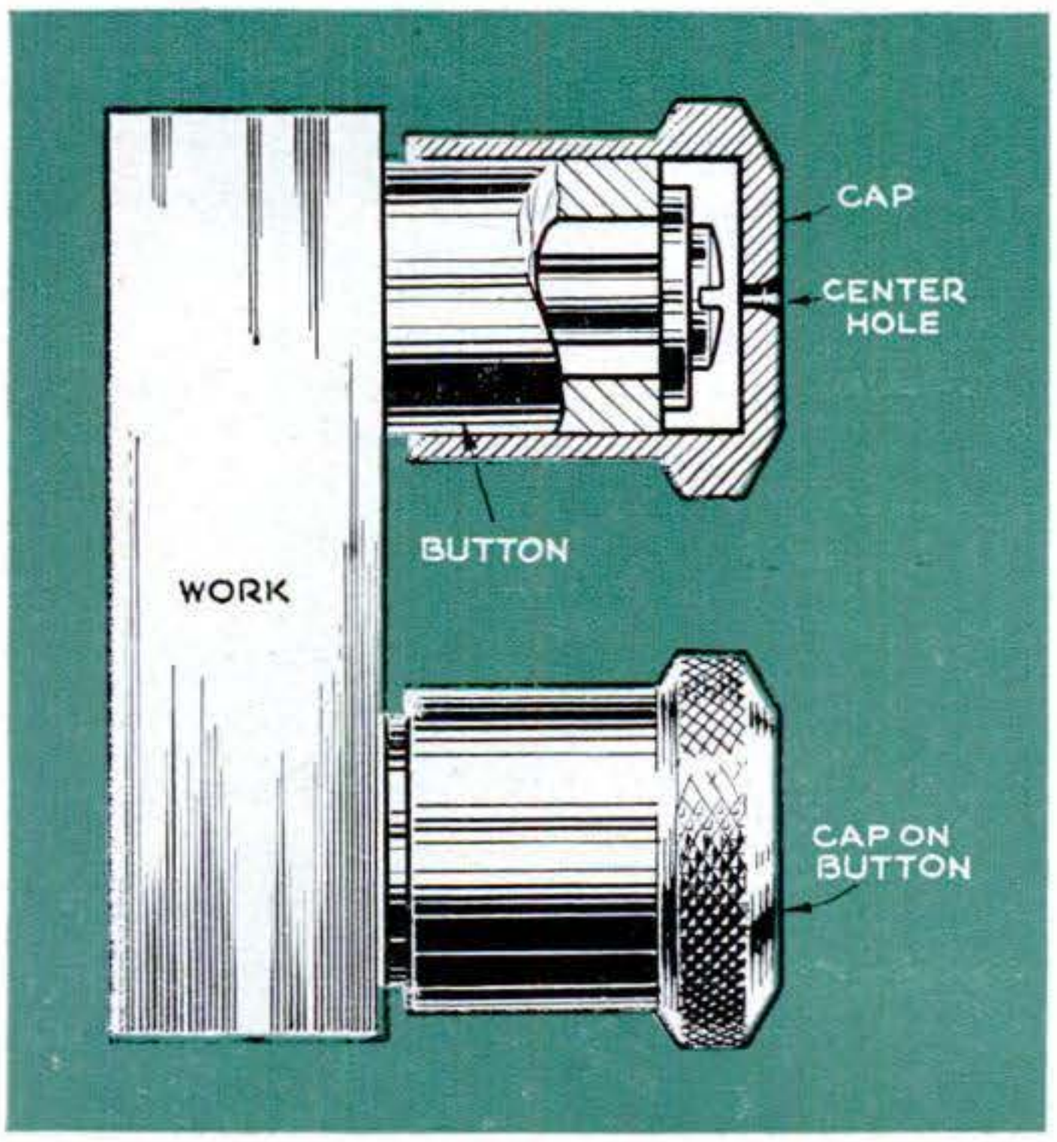


Baking Pan Catches Chips. As shipshape as the big oil pans used under industrial lathes, a good-sized aluminum cookie tray makes it a cinch to clean under your lathe. It also helps keep chips off the floor. Cut a slot in from one edge to fit around the headstock pedestal. Drill and file a keyhole at the other end to engage a screw partially driven into the top of the bench or stand. This makes the tray easy to remove for dumping, but holds it in place with no danger of tipping. Cut the keyhole so that a pull is required to free it.—*Herb Pfister, The Bronx, N. Y.*

Save Your Old Taps. Just because taps are worn out is no reason to throw them away. There is good steel in them. Ground to a point, they make fine center punches.—*Warren Norcross, Philadelphia, Pa.*

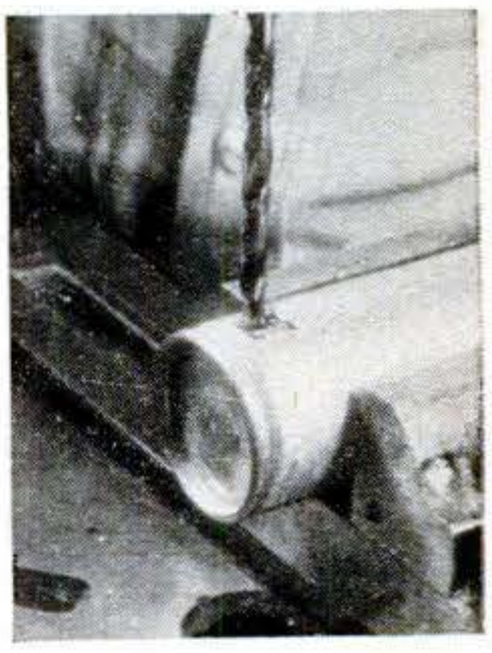


Drilling a Ball. You'll get a hole dead true on the diameter of a ball every time with this simple jig. As dimensioned, it takes balls up to 7/16". A steel block is drilled and tapped as shown. The ball is clamped in this with a cap screw that has been accurately centerdrilled as a drill bushing. Steel bearing balls must, of course, be annealed before drilling.—*John Kretzschmar, Monsey, N. Y.*



Centering Toolmaker's Button. A wiggler will serve for setting up toolmaker's buttons on the lathe if you have no dial indicator. Turn a cap with a small center hole in the face to a snug fit over the button. Such a cap can also be used with a center finder for setting up work on the milling machine or radial drill.—*Jesse R. Lucas, Michigan City, Ind.*

Chips Kept Out. To keep drill chips out of a closed hollow body in which a hole must be made, put some heavy gear oil or molasses on the drill point. Break through as gently as possible. —*Will Thomas, Kenmore, N. Y.*



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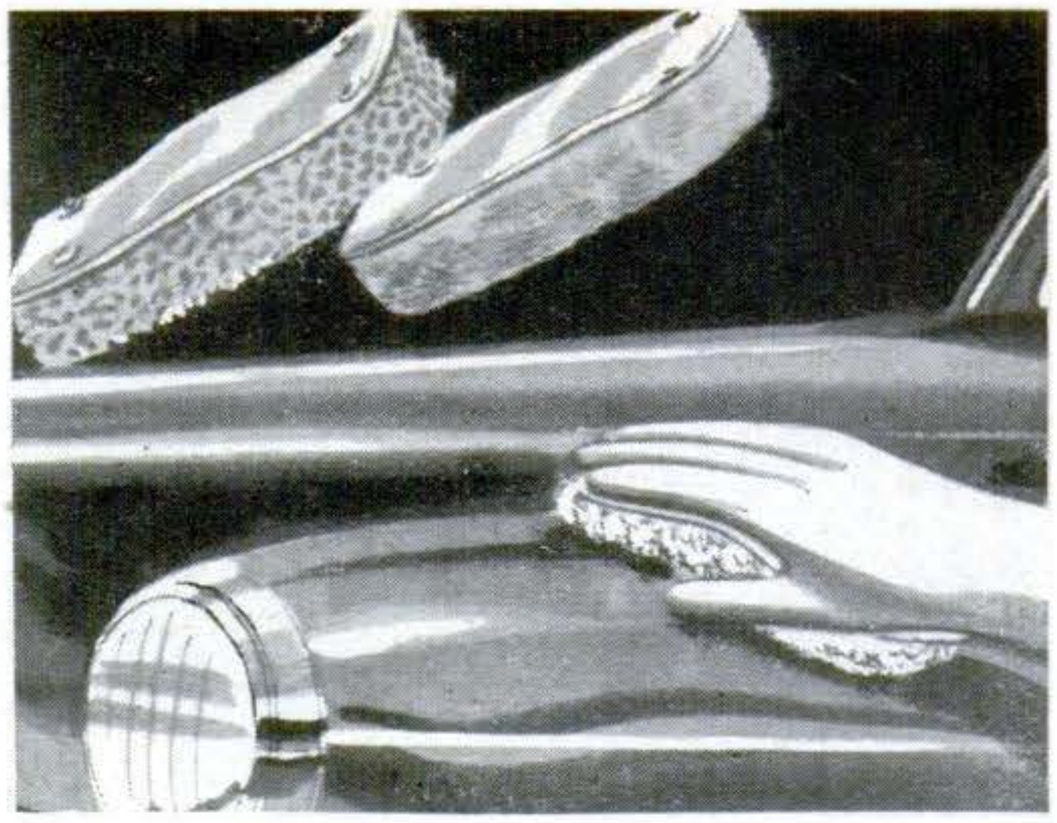
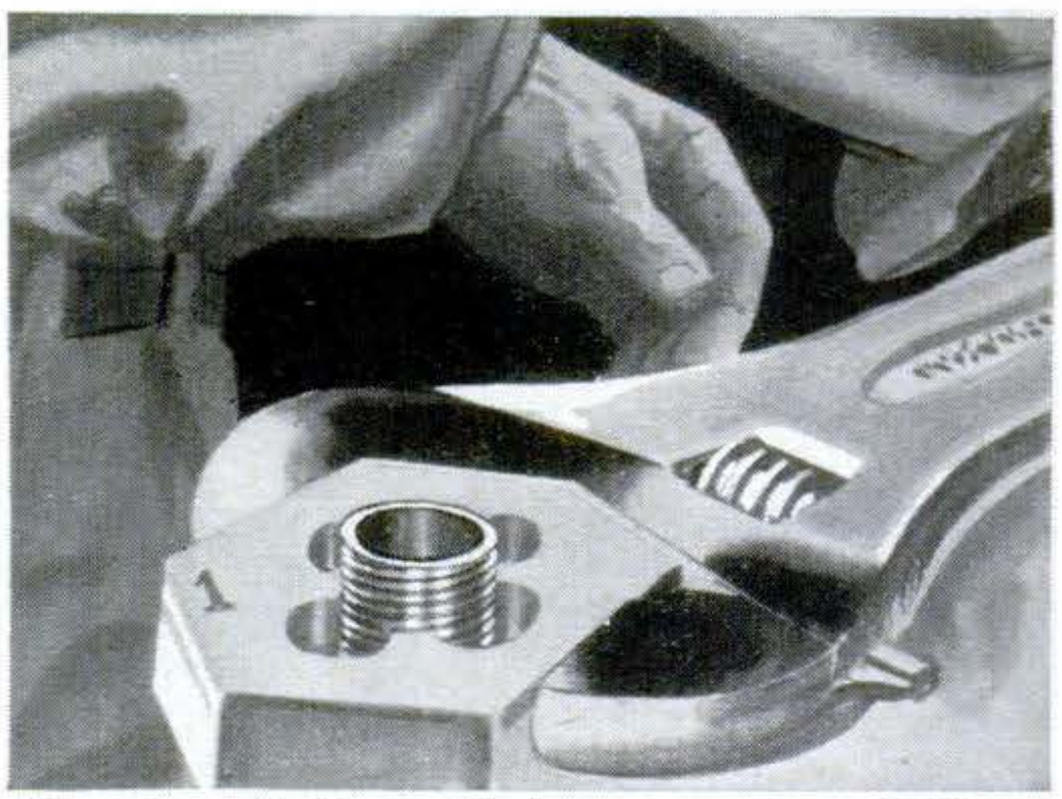
I'd like to see them make . . .

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



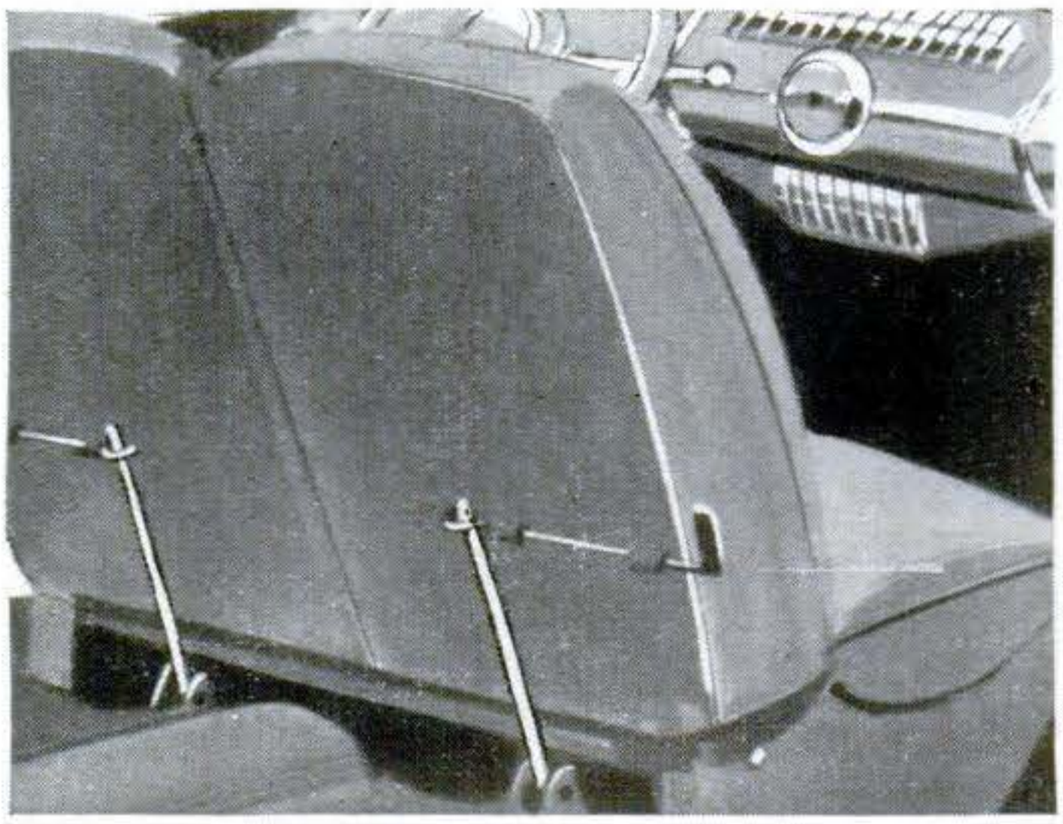
Rubber gloves with pads. One interchangeable, snap-on pad could be sponge rubber for washing; another could be cloth for dusting; while a third could be lamb's wool for polishing.—*Arthur Miller, North Bergen, N. J.*

Small rubber-tired wheels of various sizes. These would be used as replacement wheels for toys when children break them. You'd be able to salvage many an otherwise useless toy.—*Mrs. S. R. Winchester, Tacoma, Wash.*



Hex-shaped dies. If they were shaped like a hex nut instead of round, rethreading dies could be turned with a wrench instead of a diestock. They'd be easier to work in tight spots.—*Walter F. Troop, Madisonville, Ky.*

Transparent cement for laying glass bricks. These would greatly improve the finished appearance of a glass-brick wall. Maybe a silica-base cement could be used to do the job.—*George Wagenhauser, West New York, N. J.*



Safety latches for the front seats of two-door cars. In case of a sudden stop or accident, a rear-seat passenger woudn't—if thrown forward—force a front-seat rider against the dash.—*Lee A. Wilhite, Marshall, Mo.*

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Repair That Broken Blind Yourself

Caught when the window was closed hurriedly, this center slat was snapped off, but damage isn't as bad as it looks.

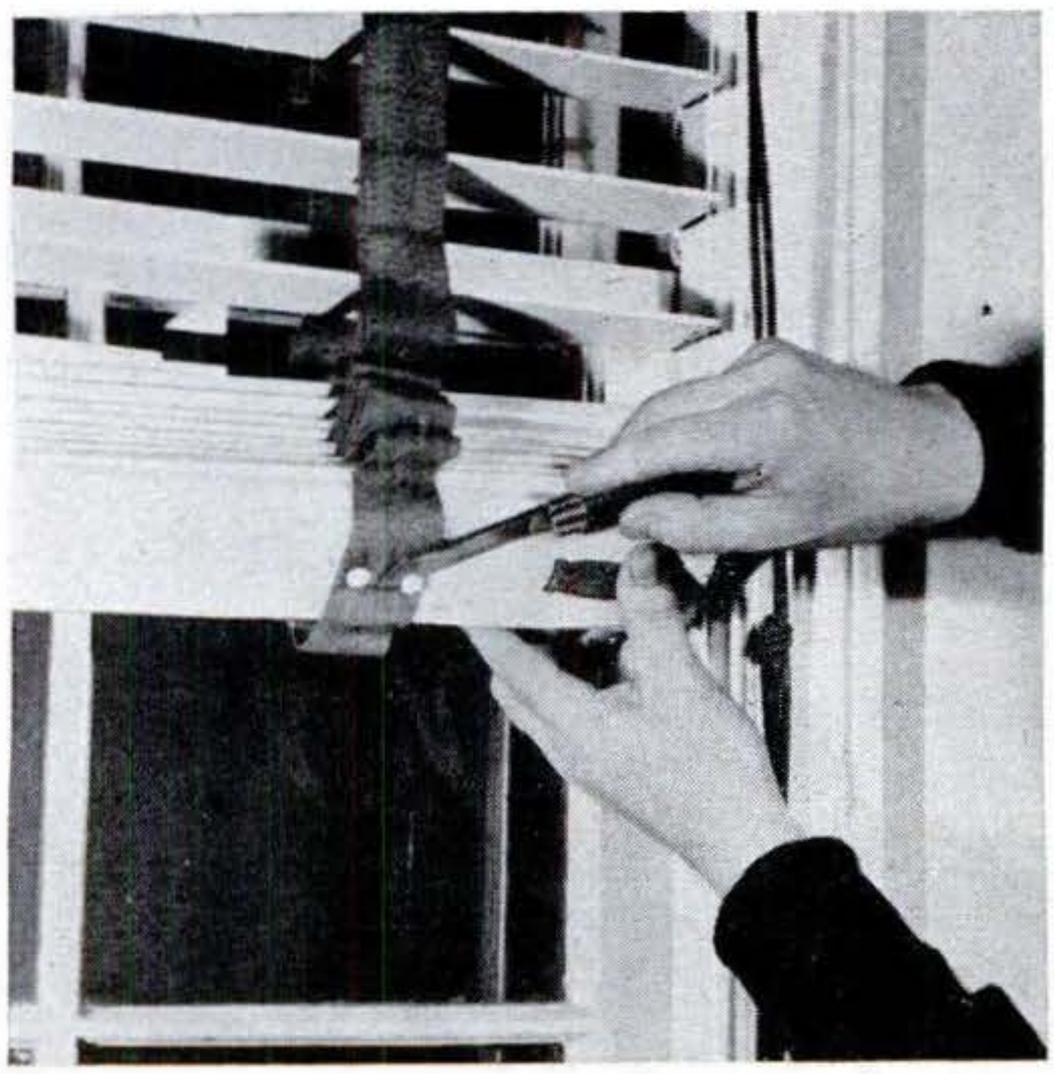
SUDDENLY a rain squall blows up. You run around closing windows. As you pull at the control cords of a Venetian blind with one hand and tug at a window with the other, there's a sharp snap. And you find yourself holding a splintered slat.

Stop a minute before you phone the repairman. A replacement slat costs very little and installing it is almost as easy as slipping a new blade in your razor.

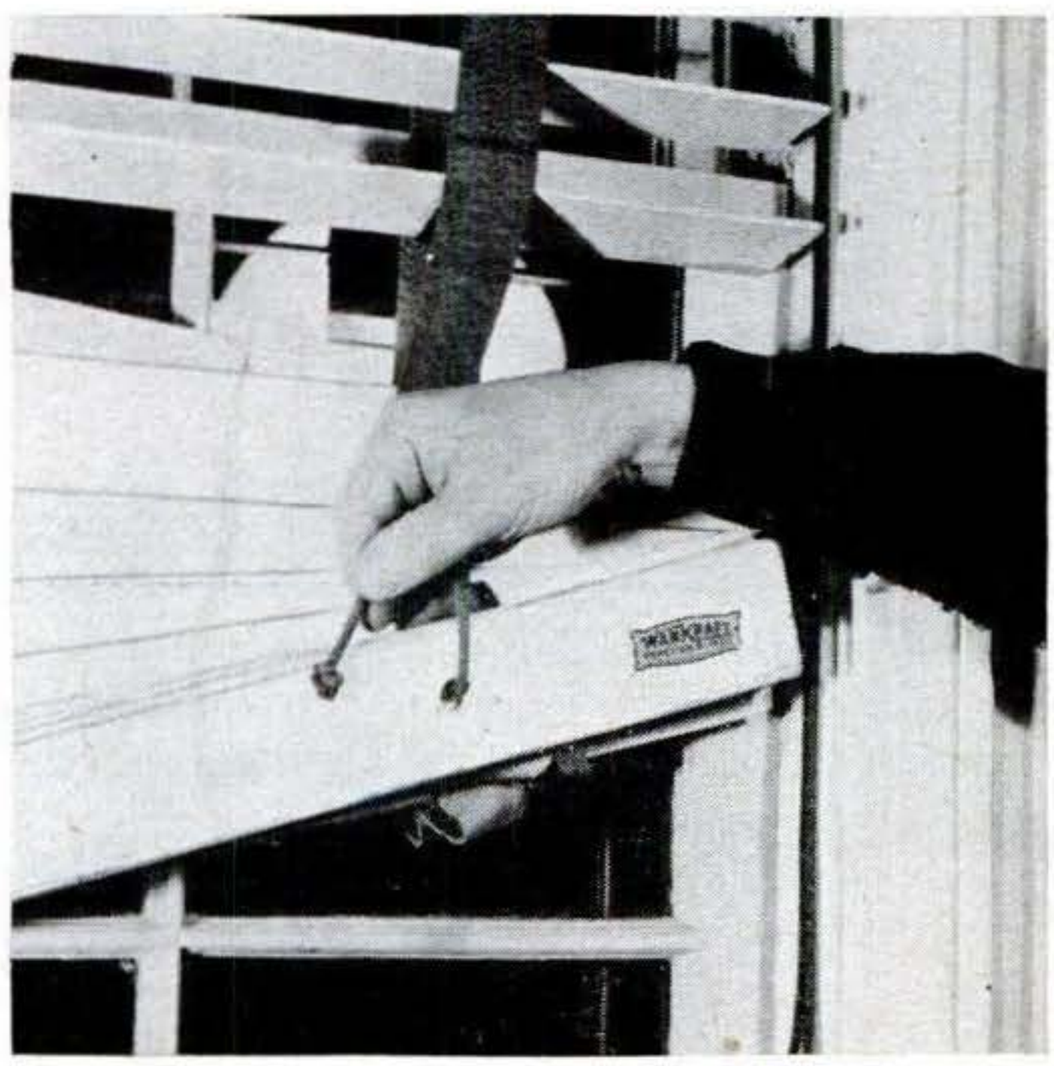
Here's how:

Turn up the bottom bar. You'll see that the ends of the tapes are held by staples or tacks. Pry them out. Then you'll find that the ends of the cords are knotted and that the knots fit in counterbored holes. Untie the knots and remove the bottom bar.

Reach up between the top bar and the top slat and pull the cords up out of the slots in the slats. Now you can pull the slats off the crosspieces of the tapes. Take out the top slat and put it in place of the broken one. Slip the new slat in place at the very



To get to ends of cords that control raising and lowering of blind, pry out tacks holding ends of tapes to underside of bottom bar.



With tapes loosened, knotted ends of cord are accessible. Pull out cords and untie knots. Bottom bar then can be slipped off cords.

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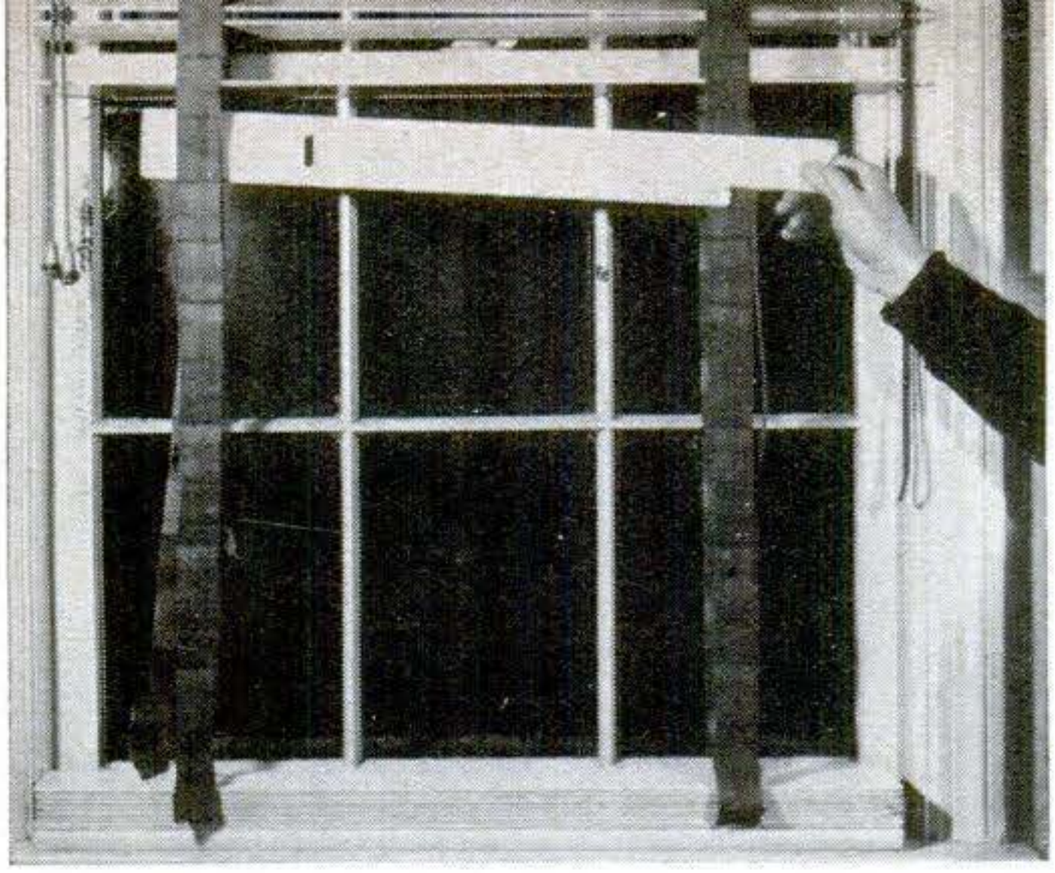
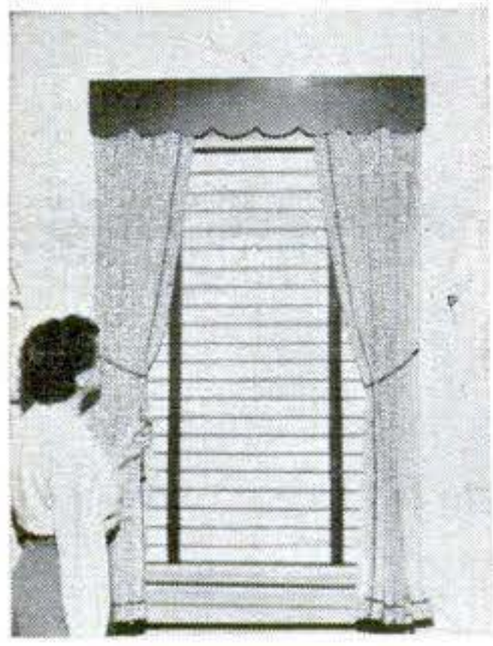




After cords are pulled up through slots in slats, broken one can be removed. While cords are out, all slats can be taken out and cleaned.

Reassembled blind (left) is good as new. Actual disassembly and reassembly of the 22 slats in this blind took only 15 minutes.

top. If its color doesn't quite match the color of the older slats, the new one will be much less noticeable at the top than anywhere else.

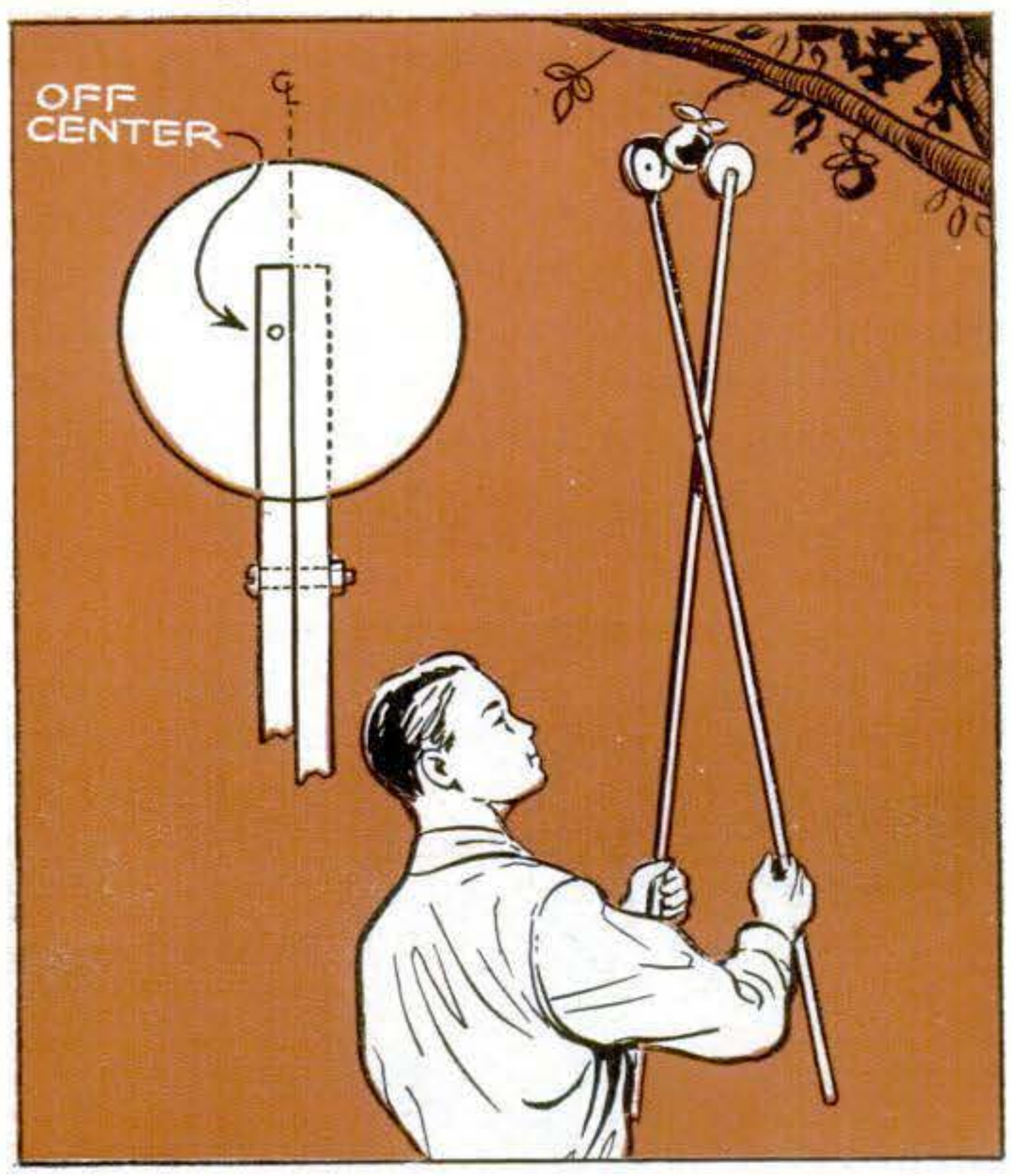
While you have the blind disassembled, it might be a good idea to take out all the slats and clean and wax them. This job is much easier to do with the slats lying flat on a table than when they are hanging.

There's a chance that you might not even need a new slat. The tapes of some blinds stretch after they've been hanging a while, causing the bottom bar to scrape the window sill. Replacing the broken slat with one from the bottom and shortening the tapes may actually improve the hanging qualities of the blind.

Now reassemble the cord and tapes and the blind's as good as new.

A bent metal slat can be removed in the same way. After you straighten it out, reinsert it in the top position.—*Robert Hertzberg, Jackson Heights, N.Y.*

Jar Caps Make Fruit Picker



You can build a handy, laborsaving fruit picker with a couple of jar caps and scrap wood. Cut the two strips of wood to the length you want them. Join the pieces with a nail, wood screw, or nut and bolt so they can be opened and closed like a pair of pliers. Fasten the two jar lids to the ends of the sticks off center. Then they will line up with each other when the picker is closed.—*A. R. Morgan, Naugatuck, Conn.*

Metal Subs for Broken Mirror

Should the top-surface focusing mirror of a reflex camera become broken or damaged, you can substitute a piece of chromium-plated sheet metal. A chromium ferrotype plate is one possible source. A metal mirror from a shaving kit is another. Cut the metal with a fine-tooth hacksaw or a metal-cutting bandsaw. File the edges smooth. Polish with ferrotype polish before installing.—*Walter E. Burton, Akron, Ohio.*

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Hose Unwinds While the Water Runs

By Will Thomas

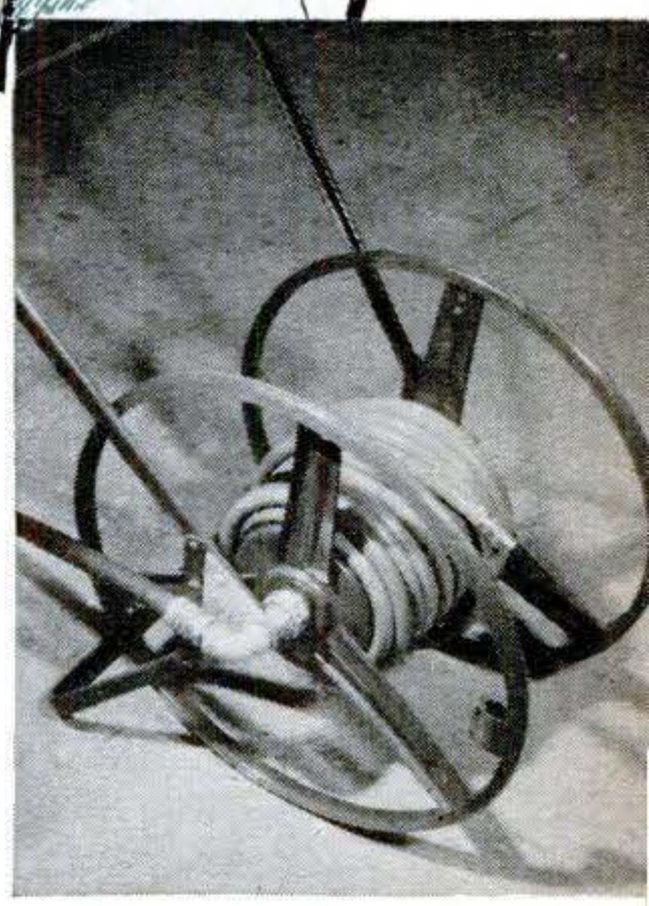
YOU'LL be the envy of the neighborhood when you have a hose reel like these. Take your pick of one that can be rolled anywhere, or one permanently mounted on the house wall. With either, sprinkling the lawn or garden is no chore at all.

You just pull off as much hose as you want—six feet or sixty—and turn on the faucet. No more wrestling with yards of extra hose when you need only a short length. When you're through, just turn off the water and wind on the hose. You don't have to disconnect it from the faucet.

The water goes through a hollow axle and a revolving joint into a hose adapter on the reel. But you don't need a lathe or a course in machining to make these parts. They're assembled from standard pipe and fittings, available at plumbing shops or plumbing supply dealers. The only special tools you're likely to need are a pipe wrench and an 8-32 tap.

Aside from the hose cart, the parts shouldn't cost more than three or four dollars, and you may find some of them in the scrap bin.

Revolving joint. This would be a tough problem if there weren't a ready-made answer for it—a standard ½″ union. Get one of good quality. See that the seat is smooth and without flaws. Drill a hole in the coupling nut and tap it 8-32 to receive a setscrew, preferably the Allen type. Then lubricate the inside with graphite or auto water-pump grease, and assemble the union just tight enough so that it turns rather stiffly. Tighten the setscrew well.



Turn on the water and walk away with the hose —as much or as little as needed. Reel on house wall (above) is always ready to use. At right is a similarly converted standard hose cart.

The union may drip a little at first. After it has worn in a bit, it can be readjusted and should hold water unless subjected to extreme pressure.

Hose-cart reel. You can make this from a cart that rolls on its rims, as shown, or one with a reel mounted between two uprights to which wheels are attached.

First disassemble the hose cart completely. Since the frame members probably will be too narrow to make bearings for ½″ pipe, you may have to hacksaw a couple of bearing plates out of light steel (Fig. 1).

Figure 2 shows how the water-carrying axle is mounted in a reel with closed ends. The existing holes are simply opened out with a round file to take ½″ pipe. A hole is made in the surface of the reel for the elbow bearing the hose adapter.

If the reel has open ends, with bearing members too small to be opened out for

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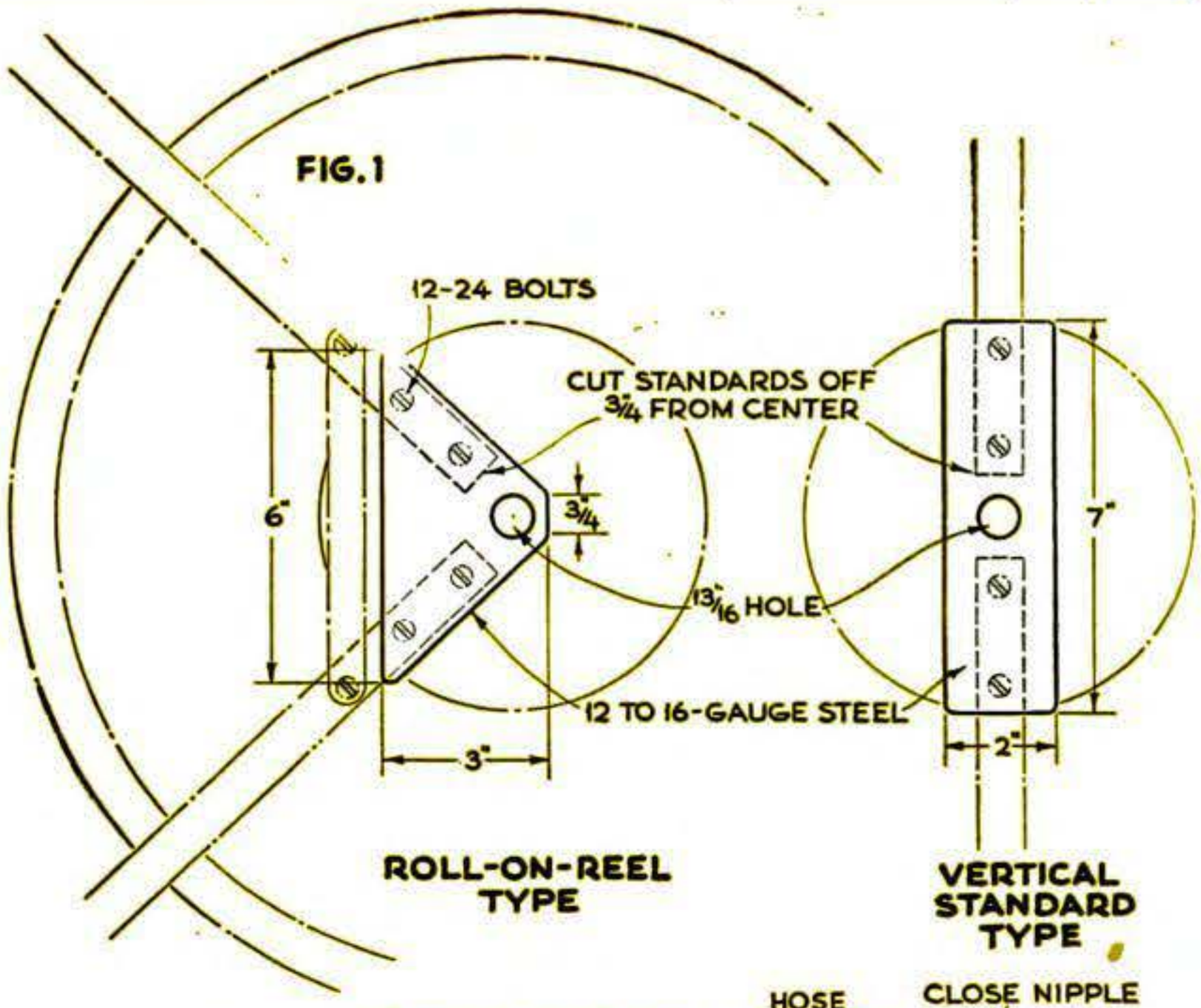
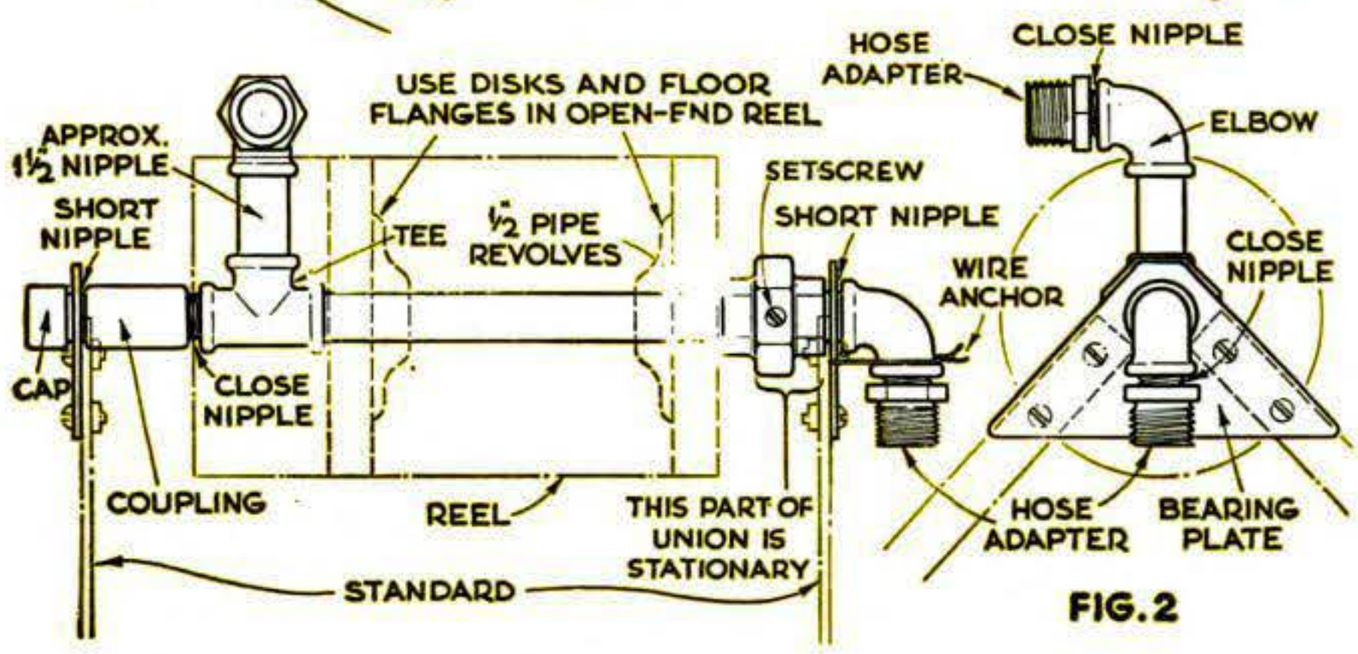
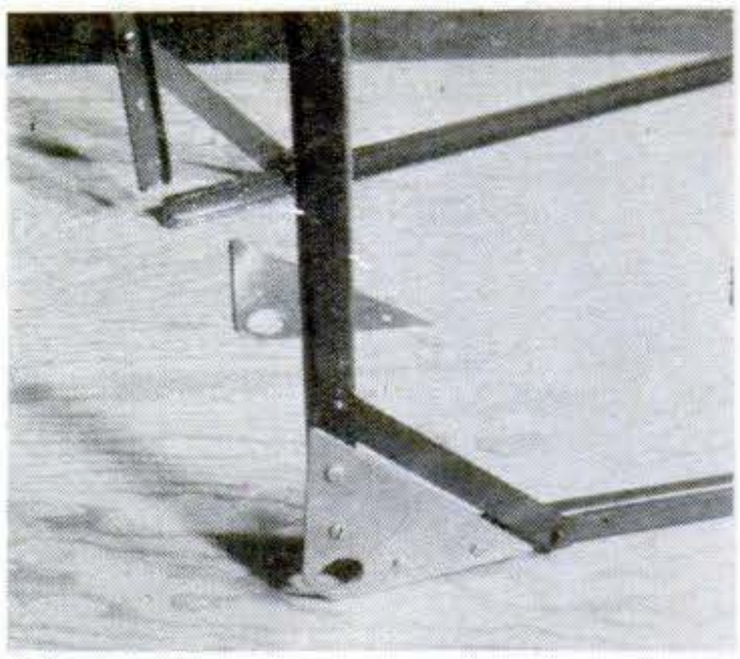
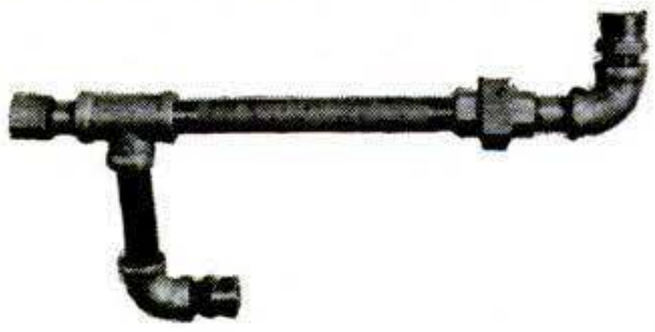




Mounting of closed reel. Dotted parts are for an open reel.



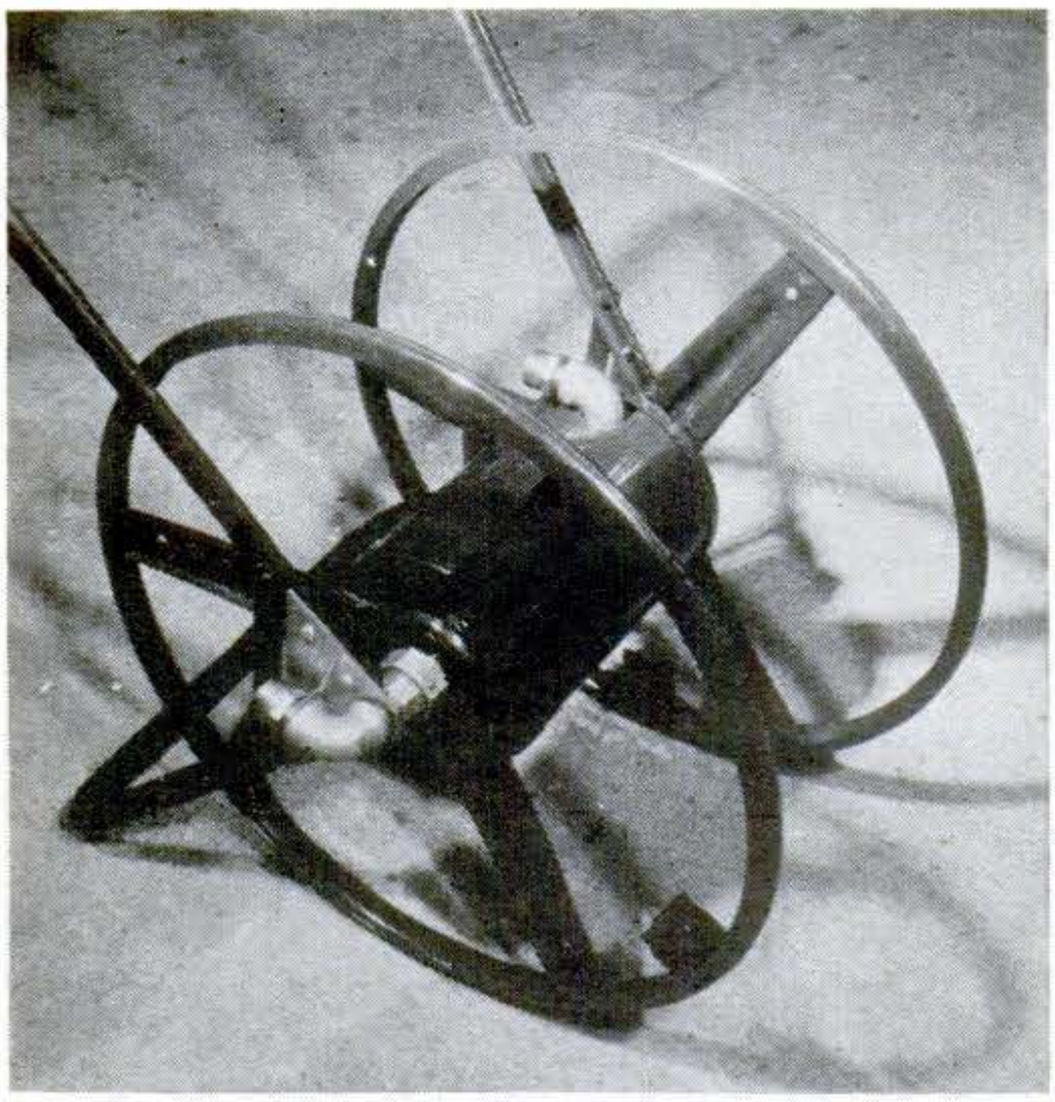
Frame members of your hose cart may be too small to drill out as bearings for ½" pipe. If so, cut them a trifle short instead. Mount simple triangular bearing plates with bolts and nuts.



Water-carrying axle unit is first trial-assembled. Longer nipples or an extra coupling may be used as spacers to suit hose-cart and reel dimensions. Use red lead on all joints.

½" pipe, cut them out. Substitute wooden disks and floor-flange bearings, as in Fig. 2.

Cut and thread the long axle pipe to the length required for a good fit in the frame. Assemble all pipe parts loosely at first to make sure they fit. In Fig. 2, a coupling is shown at the outer end to space the reel away from the frame. If this isn't needed, use only the parts in the photo. It's best to assemble the reel, water fittings, and bearing plates as a unit and then bolt the whole to the frame. Seal all pipe joints with red lead before tightening them.



Ready for use, the hose cart will hold 100′ of standard ⅝″ hose. Once rolled where you want it, it's turned over on its back, handle on the ground, so the reel is free to turn.

Use a piece of heavy wire or a simple bracket to anchor the outer elbow to the cart frame so that it can't turn. The hose adapters have ½″ pipe thread at one end and standard ⅝″-14 hose thread at the other end. Most well-stocked hardware and plumbing shops carry them.

Wall-mounted reel. Although not portable, this one takes up less space and is never in the way. It's built around a one-gallon paint can. Cut out the bottom with a rotary can opener and heat the soldered handle lugs to pull them off.

Saw two hardwood disks to fit inside the can as closely as possible, and bore a ⅞″ hole in the center of each disk. Then file out two ½″ floor flanges to a running fit on ½″ pipe, and mount the flanges on the disks with wood screws.

Cut a hole near the flanged end of the can for the hose connection. Saw out two

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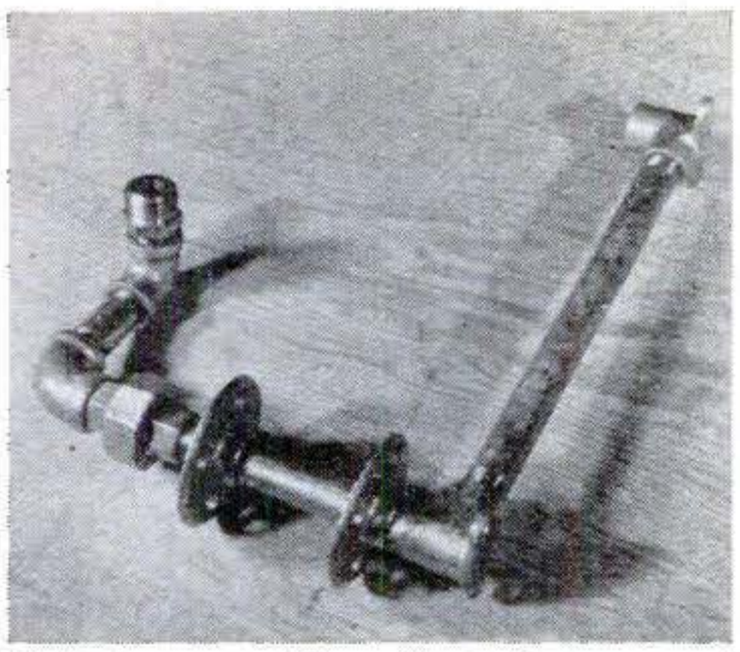
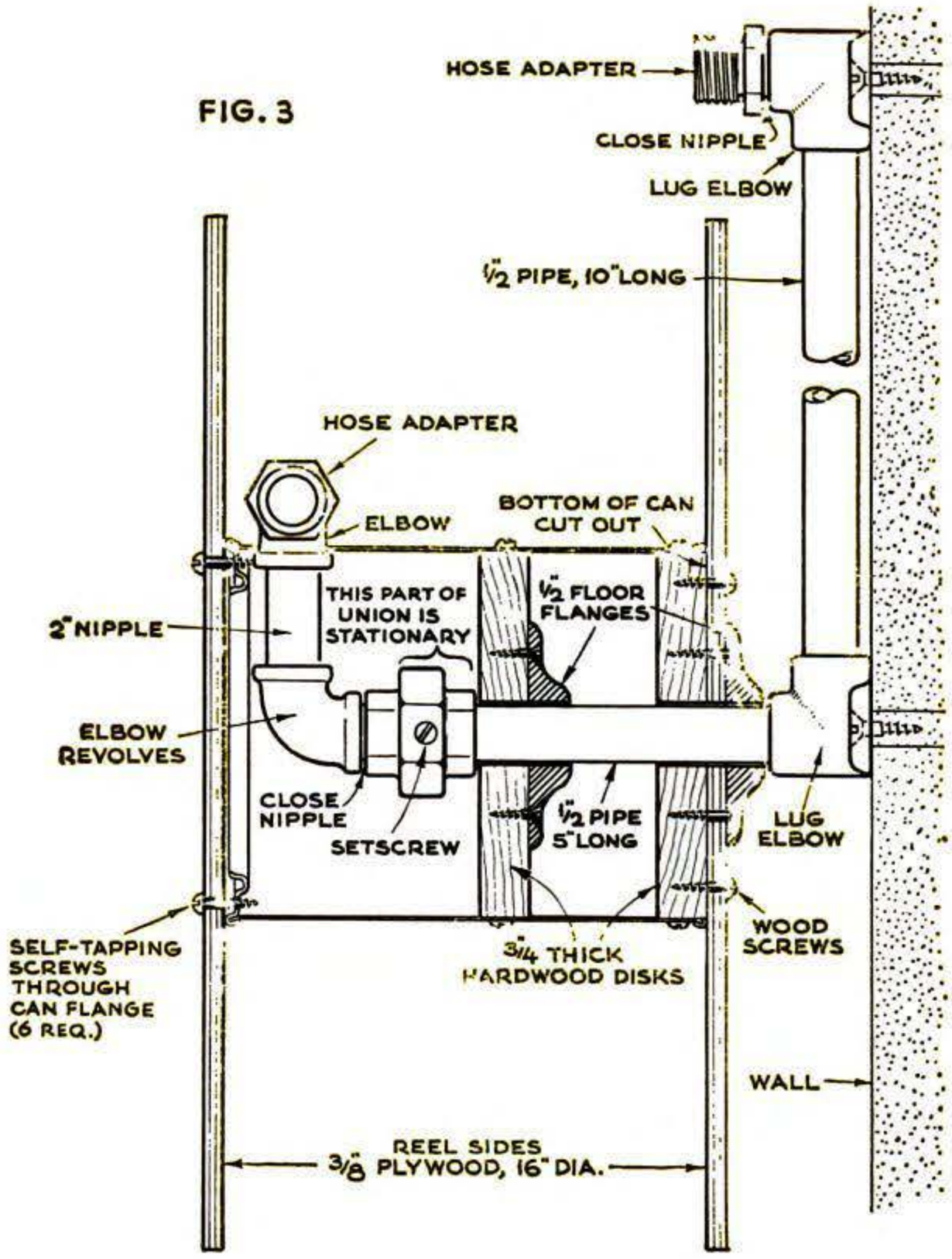


Trial assembly of vital parts of the wall-mounted reel. Hardwood disks will be fastened to the two flanges. The long pipe member at right end is attached by lug elbows to the house.

FIG. 3



Wall-mounted reel has wood sides. It too holds a 100′ hose.

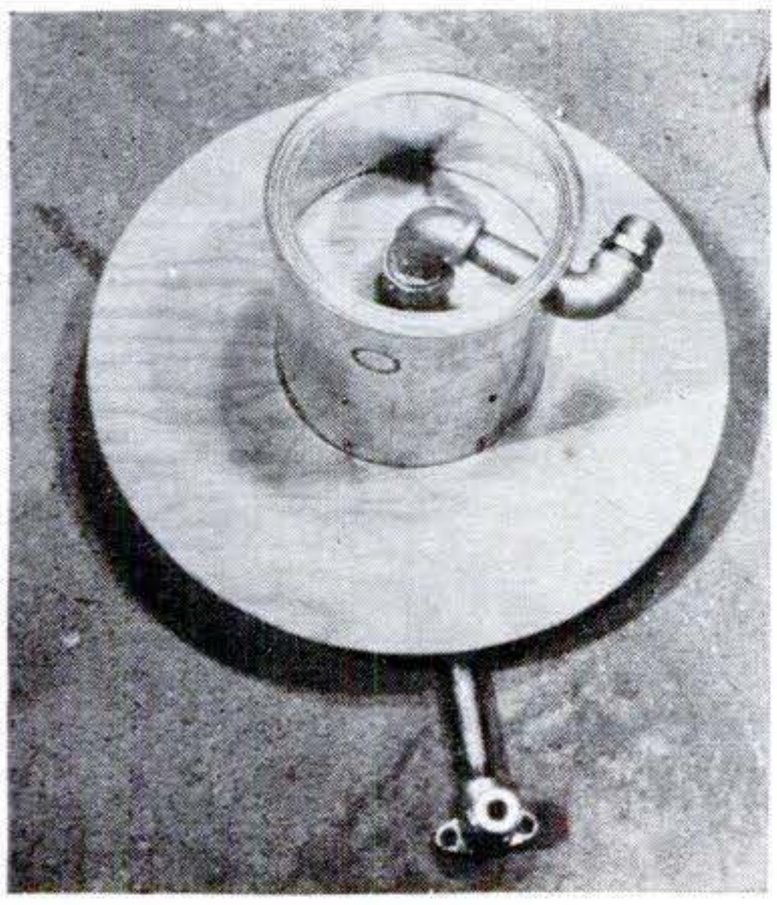
reel sides from ⅜″ outdoor plywood, ¼″ composition board, or stiff sheet metal. If you use sheet metal, have a tinsmith form rolled edges on the pieces.

Assemble the inner reel side, end disk, and bearing flange first, using wood screws. Then add the axle pipe with the second disk, union, and inside elbow. Be sure the axle pipe is fully and cleanly threaded where it screws into the lug elbow, as it carries the whole weight of the reel.

Now slide on the can, fastening it to the two wooden disks with short wood screws. Screw in the 2″ nipple with the upper elbow and hose adapter, and adjust the union. Then attach the outer reel side with self-tapping screws going through the can flange. If you prefer, you can solder nuts inside the flange and use bolts. You'll want this reel side detachable to adjust the union.

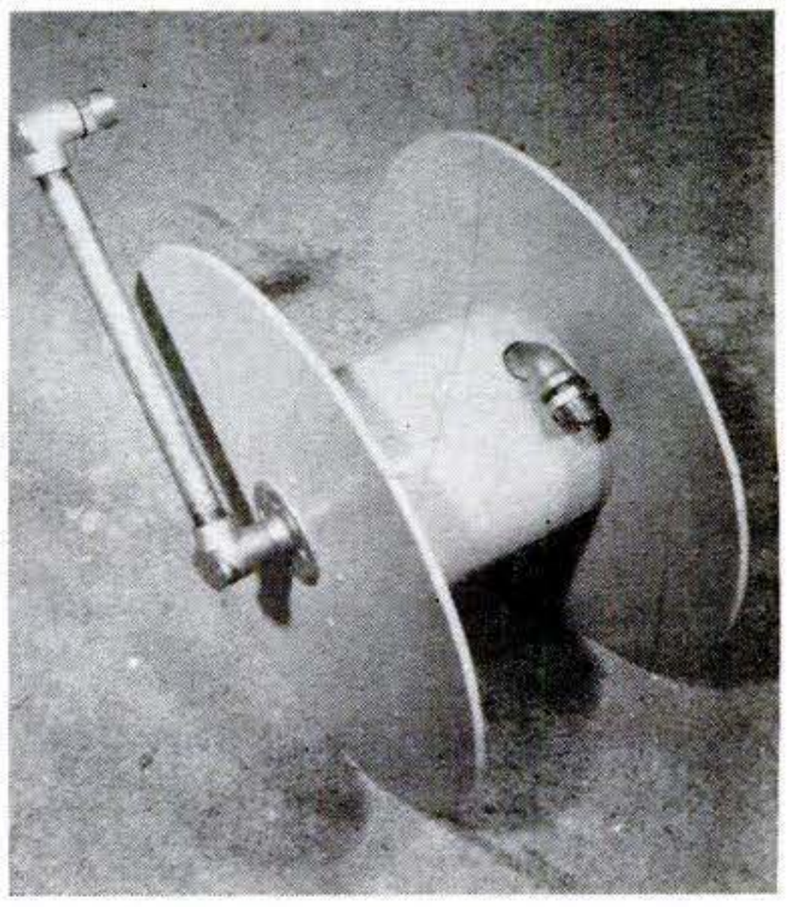
Give all parts at least two coats of a good house paint or enamel, including the inside of the can. A few drain holes punched around the can near the flange—or better still, at both ends—will prevent water from accumulating inside.

Mount the unit on the house wall, a couple of feet from the faucet, by heavy wood screws or masonry bolts through the pierced bosses of the lug elbows. Connect the outer hose adapter to the faucet with a short length of hose. END



Axle unit, can, and inner reel side are assembled as at left. The outer reel side is made detachable for adjustment of the union. Finished reel, right, must be partly disassembled for mounting on house.

Lug elbows and the pipe between them are mounted separately. Use husky wood screws on a wooden wall or trim, or bolts and suitable anchors in masonry. Screw on axle and reel and adjust the union.



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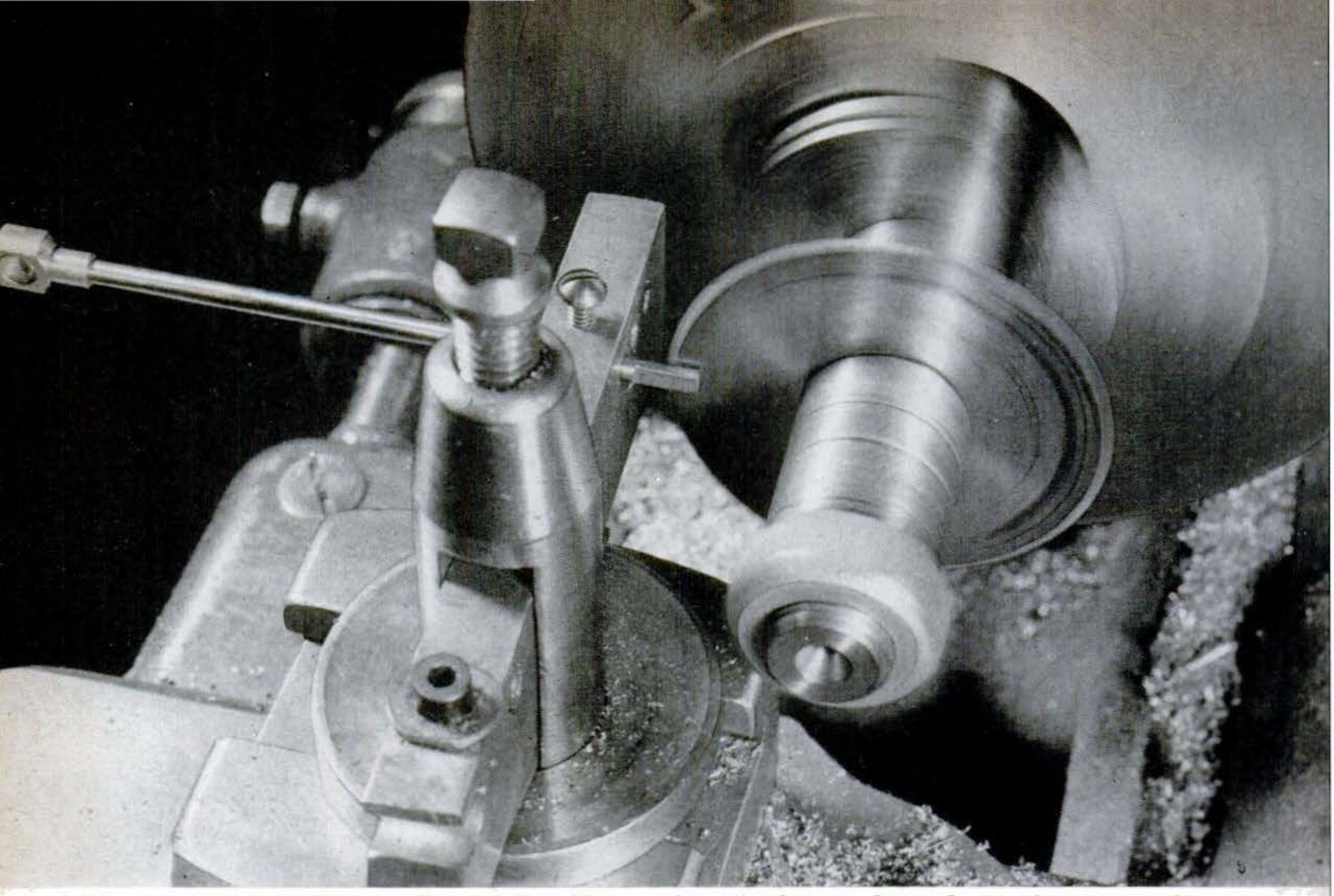

How to mill flats that *are* flat. Work held in the bar is aligned against side of slitting saw; then the bar is clamped. Similar setup splits rods, mills squares and hexes, and cuts slots.

Quick Milling Setups for Your Lathe

By Joseph Tracy

DO YOU still do all your small shaping jobs with the "Arm-strong milling machine"—also called the file? Even if you're really sharp, hand filing can't touch milling for accuracy in forming flats, grooves, radiuses, and angles.

If you have a lathe, there's your milling machine. No dough for a milling attachment? Look at the setups shown here. Then take another gander at the job you want to do, roll out your ingenuity, and go to it.

These simple rigs don't provide vertical travel, but you can do a lot with the horizontal feed of cross and compound slides. Often the "impossible" job can be milled simply by turning it around. Remember to use the back gears to get low spindle speeds, and to feed work against—not with—cutter rotation.

Homemade arbors for milling cutters can be held in the three-jaw chuck, or turned with a taper to fit into the spindle. Some cutters, like the end mill in the photos, have their own taper shank. Be sure tapers are really clean. If they tend to slip under cuts, wiping off the oil film with cleaning fluid may help. Of course a draw-in collet especially made for milling cutters is tops.

To minimize chatter, pull up the gibs of the cross and compound slides tighter than for turning. If either slide won't be moved in milling, tighten it enough to lock it. Check the saddle gibs under the ways too.

Tool-post bar. How often have you settled for an unreasonable facsimile of a slot in a thin rod, or put up with a rounded surface where you wanted a flat? The jig shown at the top of this page, devised by

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Floyd McGuckin, of Ridgewood, N. J., is so simple there's no excuse for doing without it. A natural for modelmakers and others who do small machining jobs, it'll split shafts, slit screws, form square or hex ends, and produce tailor-made flats in no time. Unlike most substitute setups, it takes only minutes to make and rig on the lathe.

Aside from an arbor for the cutter, you need only a rectangular bar that fits into the tool post. Drill holes through this bar at lathe center height to suit the stock to be milled. Hold unthreaded rods with set-screws. For screws or parts with a threaded end, tap the hole in the bar to match.

As the drawing shows, you can also drill several holes, make a saw cut across them, and use a pinch screw to clamp rods.

Where a slot is to be centered in the piece, it's a good idea to face off the work first, leaving a little pip or stub just equal in diameter to the width of the cutter. Then it's easy to center the slitting saw on this.

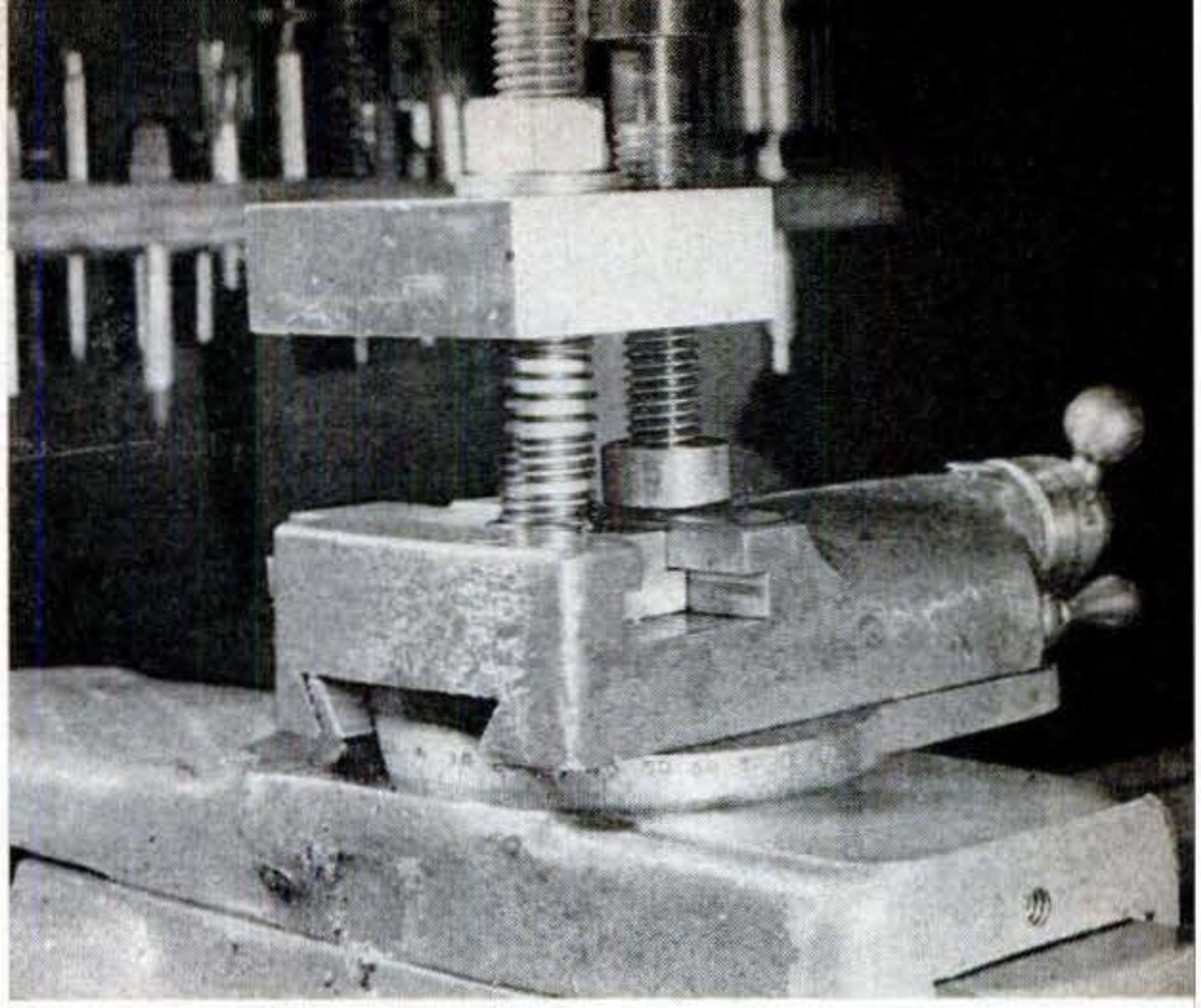
Milling vise. This is a plate of ½" steel free to slide on a stud, which is threaded into a shoe that fits the T slot of the compound. A second hole in the plate is tapped for a ½" cap screw. You can use a protective pad under this, or fit it with a swivel foot to avoid marring the compound.

Make the shoe almost as long as the T slot, shaping it with hacksaw and file. If the rabbeted edges aren't as clean as you'd like, your first job with the vise can be to mill a better shoe.

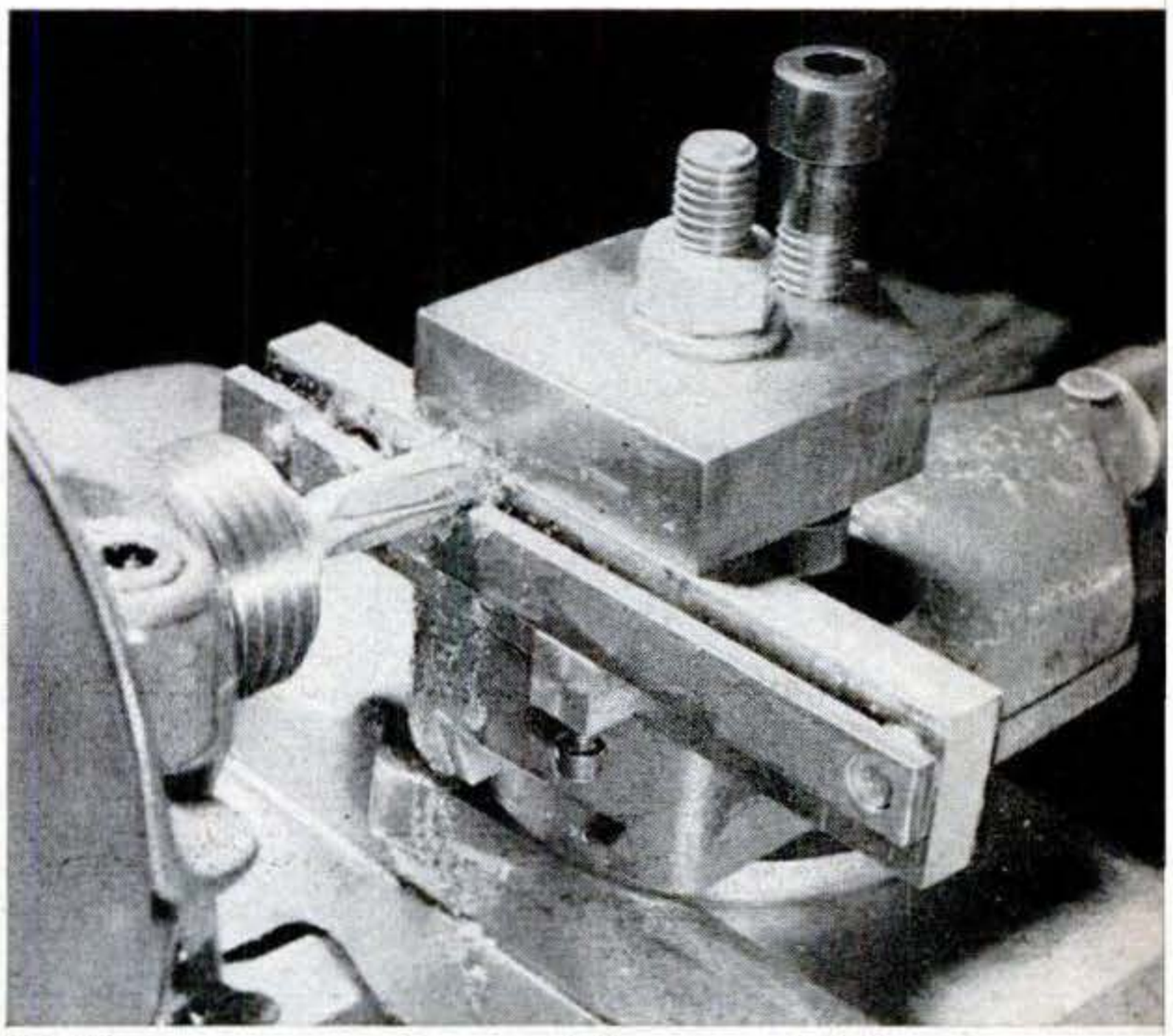
After the nut has been turned down to hold the work, the cap screw is tightened to clamp it. The height of the work (and so the location of the cut) is controlled by putting shims or packing under it.

Bar-milling fixture. Typical of the tougher jobs is milling the mid portion of a bar narrower than the ends, as in making connecting rods for a model locomotive. One photo shows this being done with a special fixture held in the milling vise. The bar, drilled at both ends to suit the crank-pins, is placed on matching pins set into the fixture. For rigidity, the bar is supported midway by a screw, as shown in a drawing. The cut is begun by moving the bar against the end mill with the longitudinal feed of the lathe; then the work is traversed with the cross feed.

Forming end radius. To mill a true radius on the end of a bar, turn a short pin on the head of a big cap screw. Clamp a piece of ½" plate in the milling vise and run

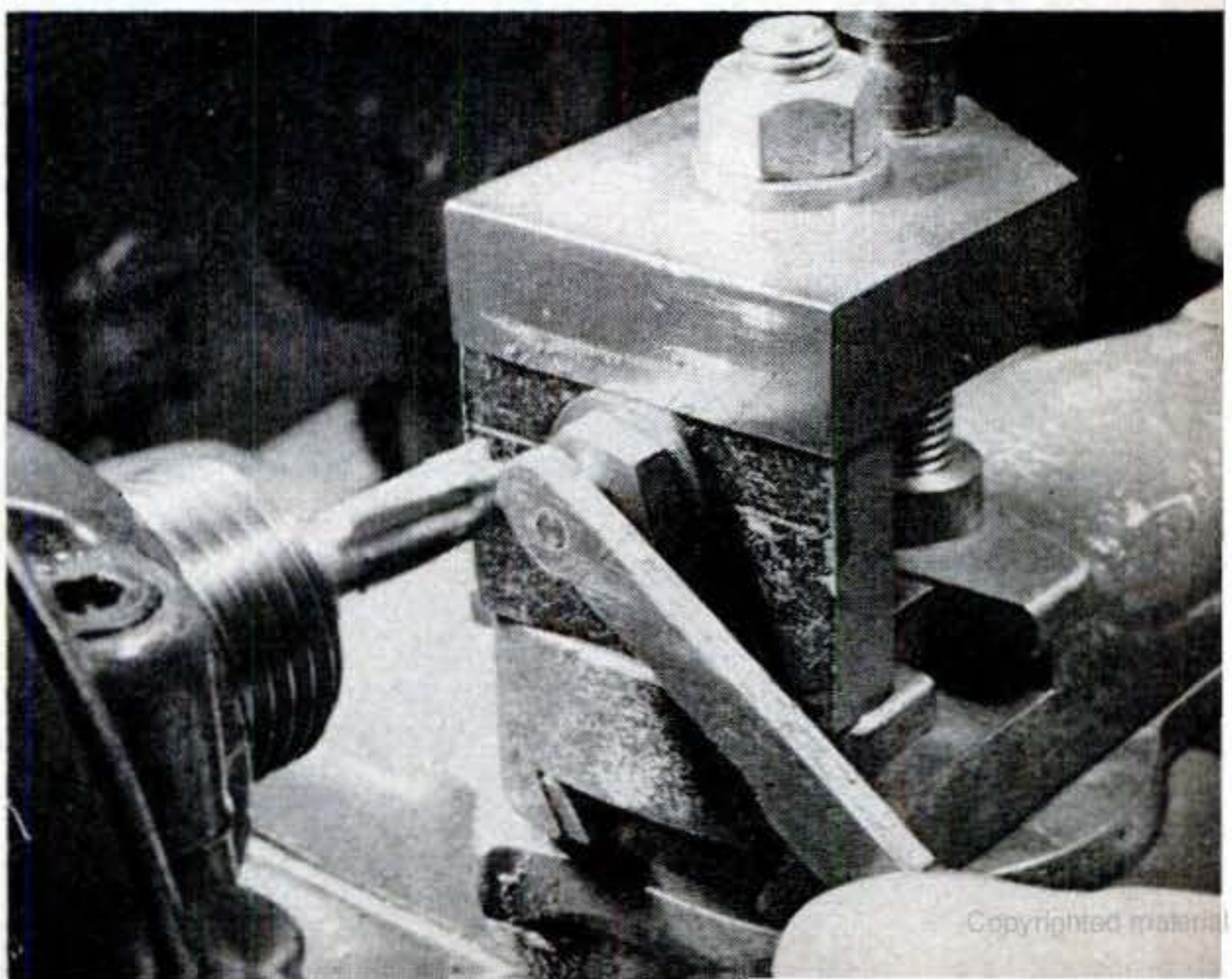


Simple milling vise locks into T slot. The spring on the center post holds up the top plate for easy insertion of work. Tightening rear bolt clamps work between plate and slide.



Milling a connecting rod for a model locomotive. Here a left-hand end mill is being used, with the lathe running backward. Work is therefore fed forward, against rotation.

By swinging a bar on a pin against a cutter you can mill a true, clean radius on the end.



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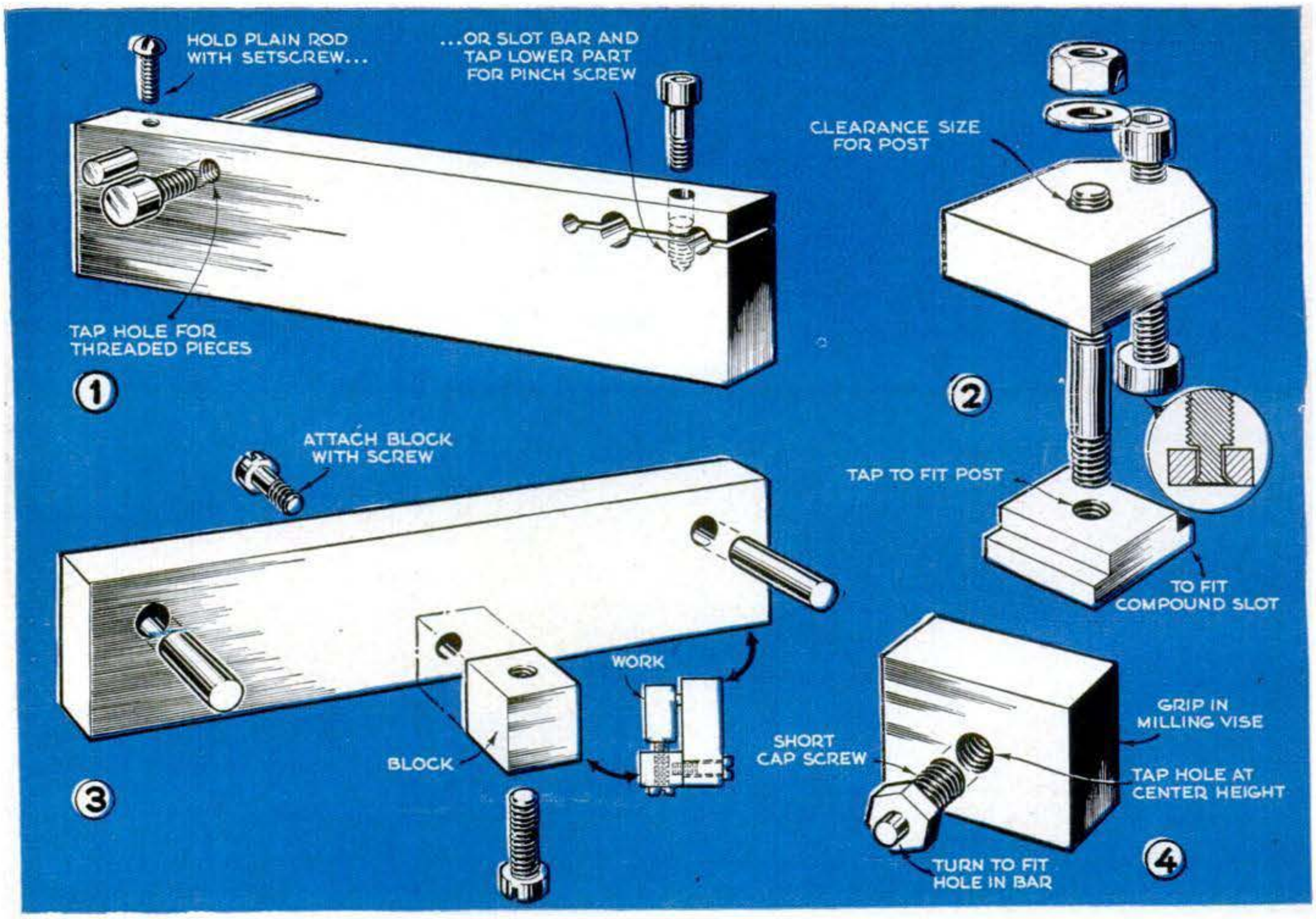
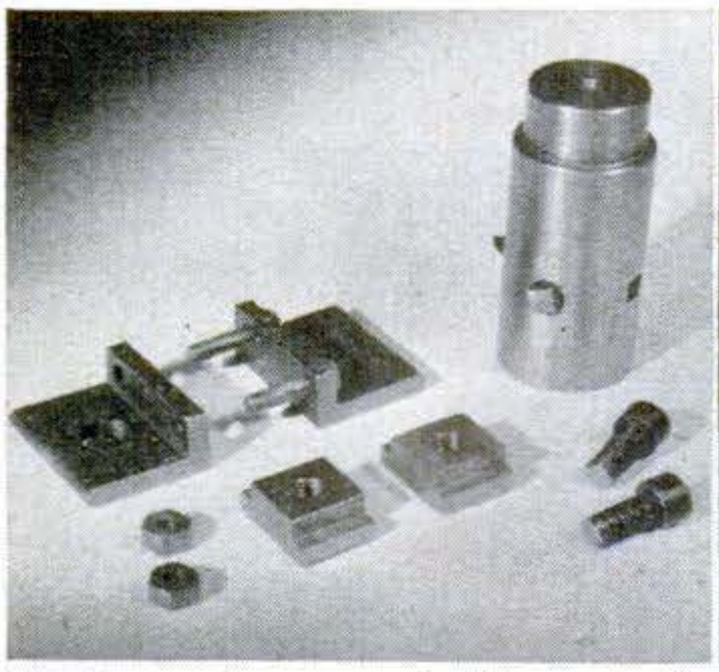


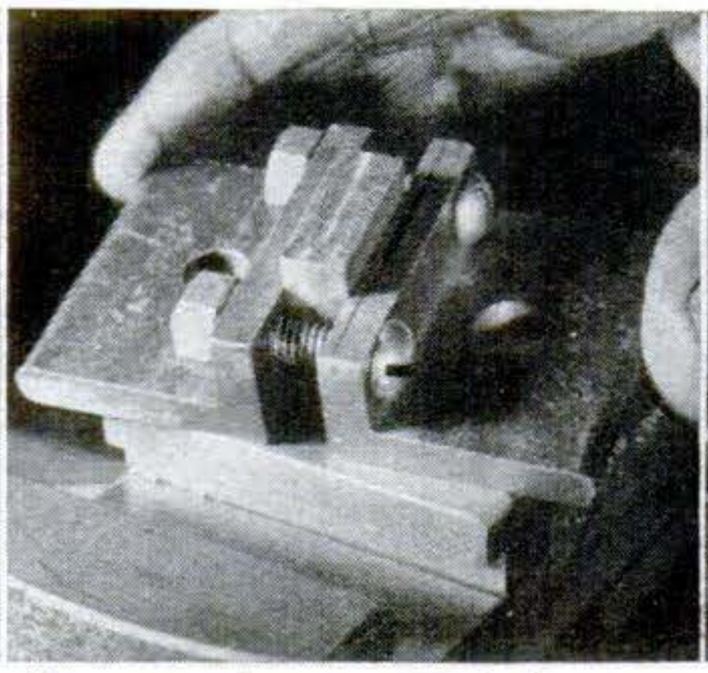
it up against a drill chucked in the headstock. Tap the resulting hole to match the bolt and turn the latter in tightly.

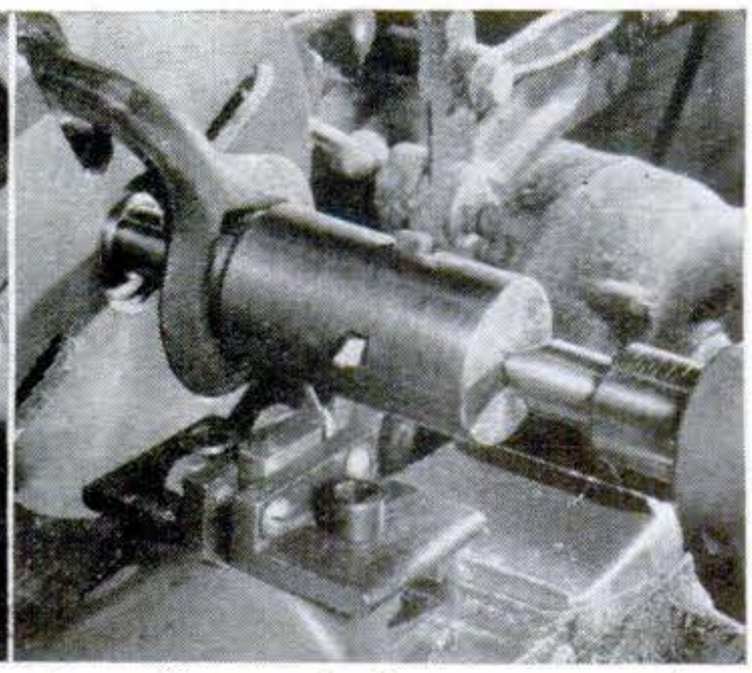
With the bar on the turned pin, advance the cross feed just enough to nick the corners. Swing the opposite end of the bar to work against cutter rotation. Advance the cross feed slightly for the next cut, and so on. For larger pieces, thread the pin and hold the work on with a nut.

Simple milling clamp. Quickly made from a couple of pieces of angle, the little clamp in the photos below does many small jobs well. Its capacity is limited, of course, by the distance from the top of the compound to lathe center height. The angles need not be machined for ordinary work. For greater precision, the outer surfaces can be faced square in the four-jaw chuck. Two shoes are required. Work is clamped with bolts and nuts between the two angle members at the desired height, and the whole is then mounted on the compound.

Milling with fly cutter. Although end mills, keyway cutters, and small slitting saws can be used with the setups described, the fly cutter shown in a photo below has a big advantage over these: Its single cutting







Milling clamp is held in T slot by two shoes so that jaws can spread for work of various widths. In milling with a fly cutter (right above) the lathe carriage is locked in place. With bit turned as shown, lathe must run forward. Work must be run under it and fed into cutter from the rear, toward operator. Take light cuts to avoid chatter and poor finish.

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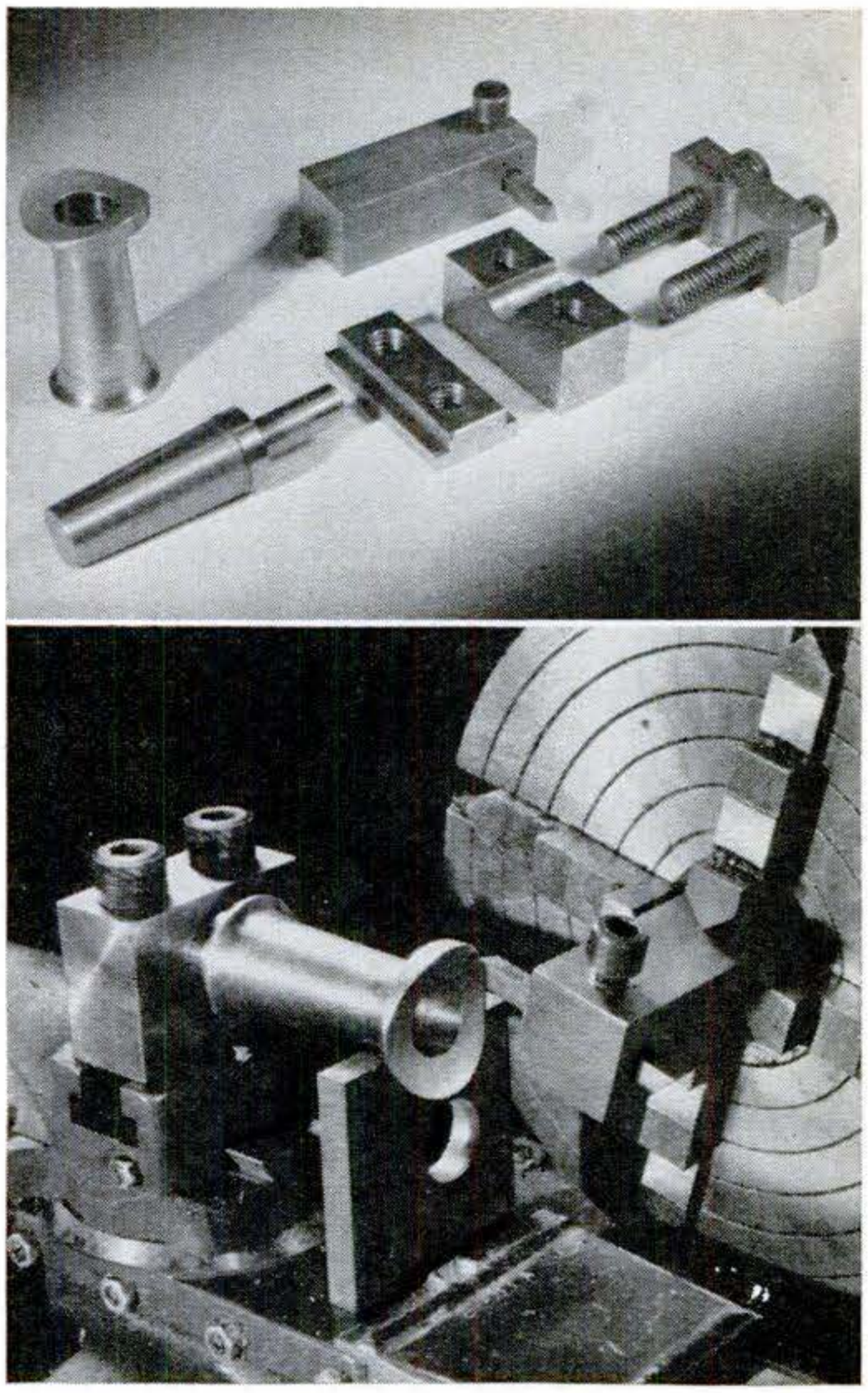
edge can easily be ground to special widths and shapes. Centerdrill a suitable bar, shouldering down one end to fit a driving dog it necessary. Drill and file a square hole on the diameter for the tool bit, and tap one at right angles to this for a setscrew to hold the bit.

Milling big radius. A fly cutter is also useful for milling comparatively large radiuses. The photo at right shows how a stack for a model locomotive was milled at the bottom to the radius of the boiler.

The material was first taper bored. A taper arbor was next turned and the piece driven on this for turning the outside. The same arbor was then mounted on the compound in a boring-bar block, the hole in the block being at center height. Because of the considerable overhang of the work, it was supported at the outer end with a block wedged between it and the top of the cross slide.

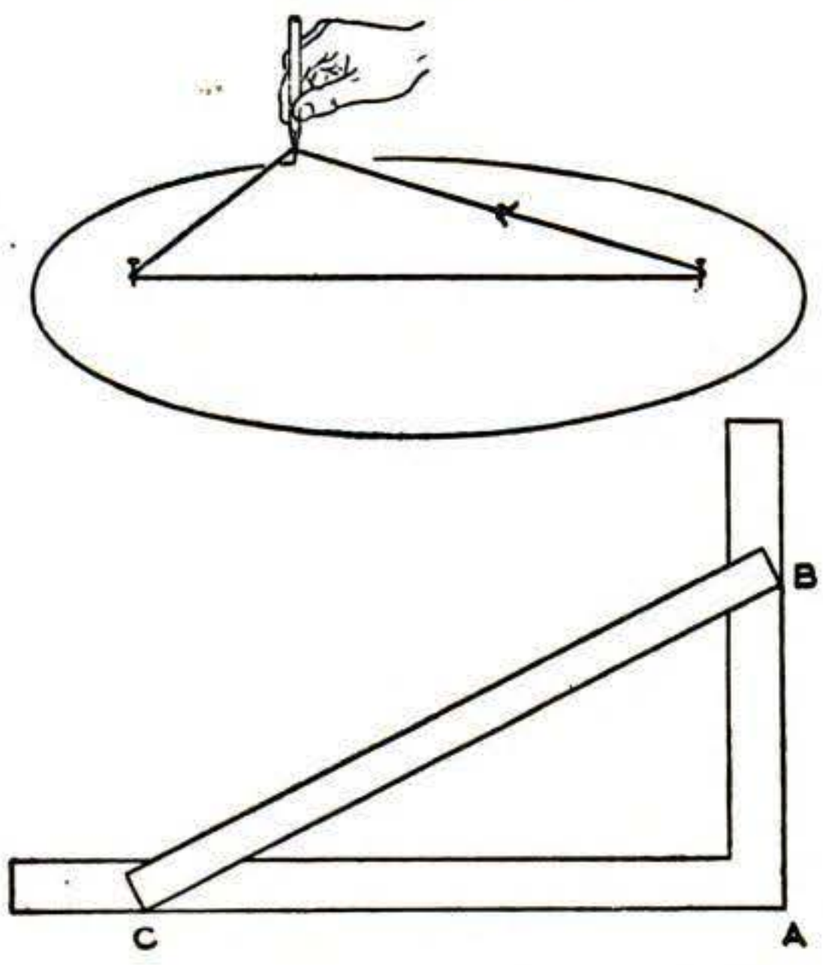
A rectangular steel bar carried the fly cutter, its flat faces giving positive drive in the four-jaw chuck. The cutter can be set to the desired radius in the bar, or the bar itself can be adjusted by moving the chuck jaws.

In milling with such a setup, take care to set the compound exactly at 90° to the ways, or the radius won't be square to the work axis. Advance the work into the cutter with the cross feed. Make the pass with longitudinal feed. END



A square fly-cutter block chucked in the four-jaw can be set to swing a desired radius by adjusting the chuck jaws. Note support block under end being milled. The finished job is a stack for a model locomotive. Taper arbor (left foreground at top) fits into the boring-bar mount shown disassembled behind it.

ELLIPSES



THE method of drawing a perfect ellipse with a pencil and a loop of string placed around two brads or thumbtacks, as shown in the diagram at the left, is frequently used in laying out work. An easy way to find the proper spacing between the brads and the correct length of string to be used is as follows:

Measure the breadth of the desired ellipse on one leg of a steel square, or any other right angle. This breadth is *AB* on the diagram. Now measure off the length of the ellipse from *B* to the intersection at the other leg of the square—*BC* on the diagram. The distance *AC* laid off on the leg of the square is the correct distance between the two brads. The sum of the distance *AC* and the length *BC* is the proper length of string in the loop.

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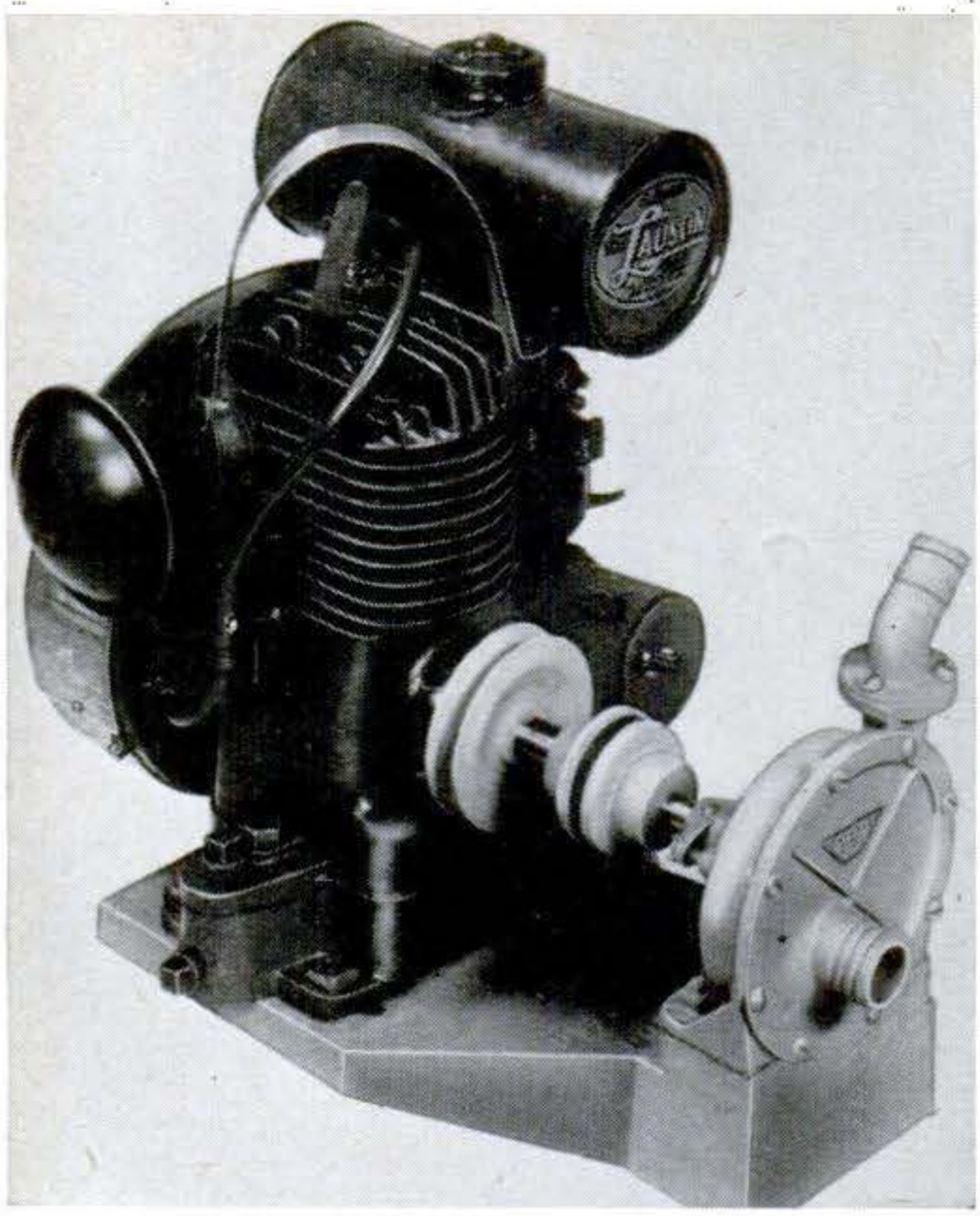
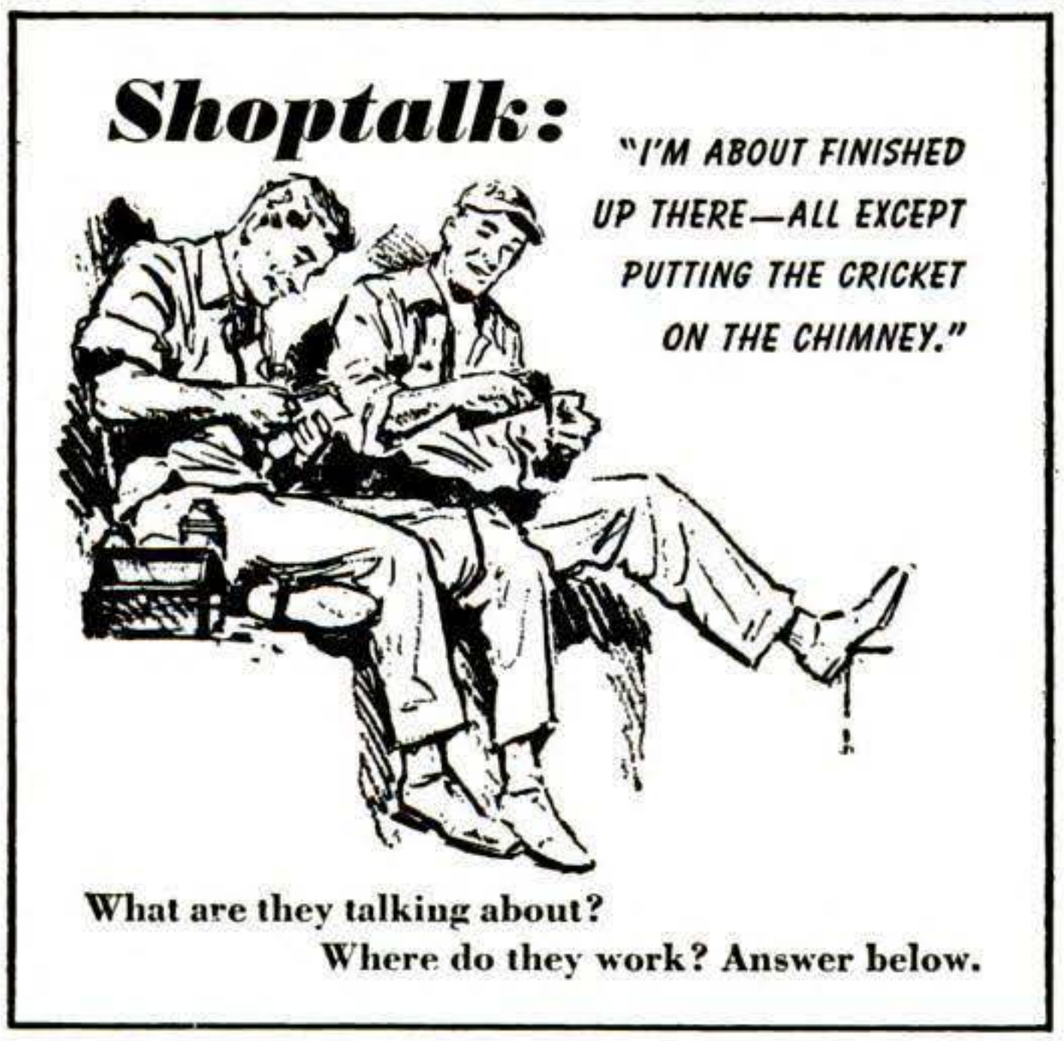
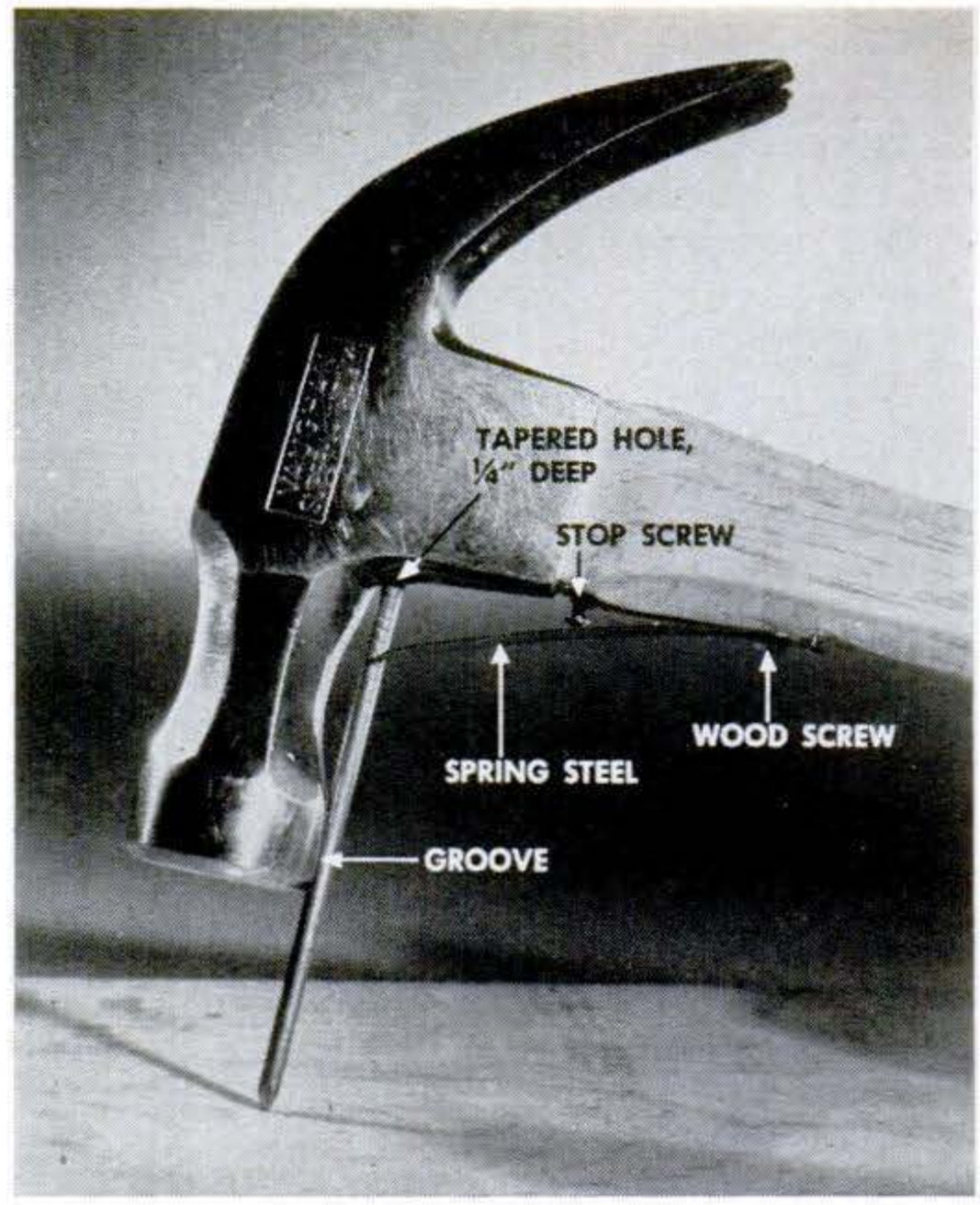


Midget Pump Packs Power

PORTABLE, and weighing only 26 pounds, the Little Gusher gives big-pump performance. In tests conducted by the manufacturer, L.R.H. Labaw & Co., of Belle Mead, N. J., it has pumped 2,000 gallons an hour to a height of 25 feet, or 360 gallons an hour, 75 feet. The ¾-hp. gas engine has a power take-off that makes the unit handy for running farm and garden equipment.



They're roofers. A cricket is a special flashing for chimneys. Regular flashing strips are all right on three sides of a chimney. But on a sloping roof, the side of the chimney nearest the ridge must be fitted with a cricket. It's V shaped and sheds water to each side of the chimney.

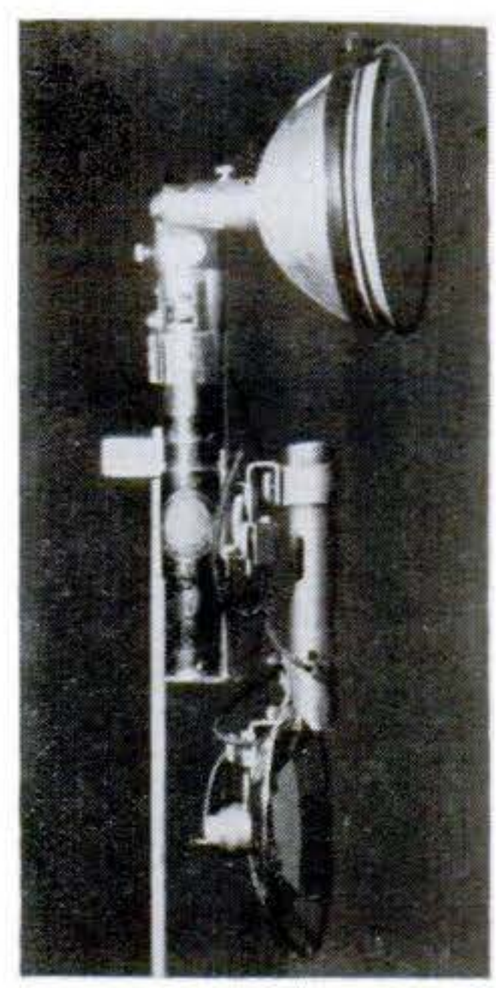


Hammer Holds Nails

AT TIMES every carpenter finds he has an awkward stretch to start a nail, or difficulty where both his hands can't reach to hold the nail and hammer, too. Putting the nail in the claws to start it works sometimes.

I found it better, however, to alter my hammer as shown in the photo. The spring holds the nail securely until the first blow starts it. Then it's easy to pull the hammer away from the nail and drive it home.—*A. F. Hendricks, N.D.*

How to Flash Two Photos Fast



WHEN you must shoot a couple of photos in quick succession—taking candids of a wedding, for instance—it helps to be able to flash twice without stopping to insert bulbs. You can do this by clamping an extension flash unit to the battery case of the master unit. Wire them in parallel through a toggle switch. On the "off" position, only the master flash will go. When this bulb is dead, flipping the switch makes the second one ready.—*Robert Chambers, Knightstown, Ind.*

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Students entering this school are handed saws on the first day and told to start using them.

Manual Training for Housewives

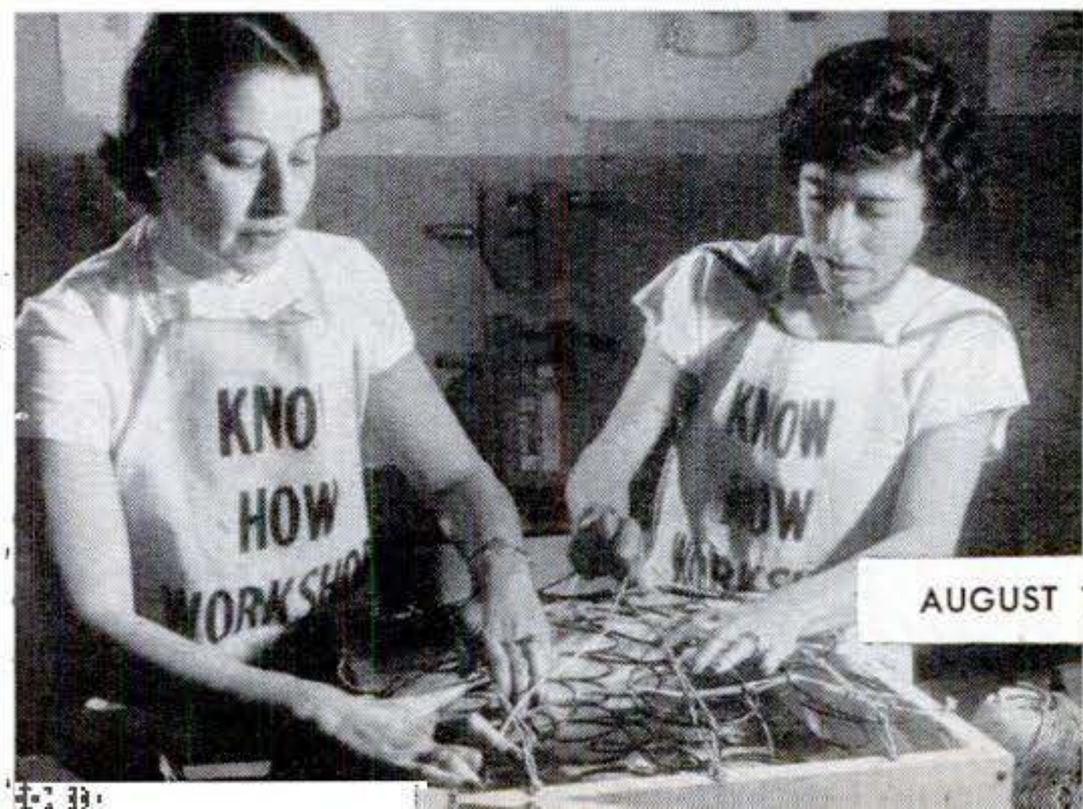
By Robert Hertzberg

NO DOUBT about it: household maintenance is no longer the husband's responsibility exclusively. It has become a joint activity, with the wife gradually assuming even more than half the share. After all, she has to contend with leaky faucets and blown fuses all seven days of the week, not just one or two.

But most women are totally unprepared for this mechanical work around a house,

Tying the springs of a chair is less complicated than knitting a sweater, these women find. Repairing upholstery is a popular subject.

How do you patch holes and cracks in plaster? This woman (being shown how to hold a trowel) will learn by repairing a make-believe wall.



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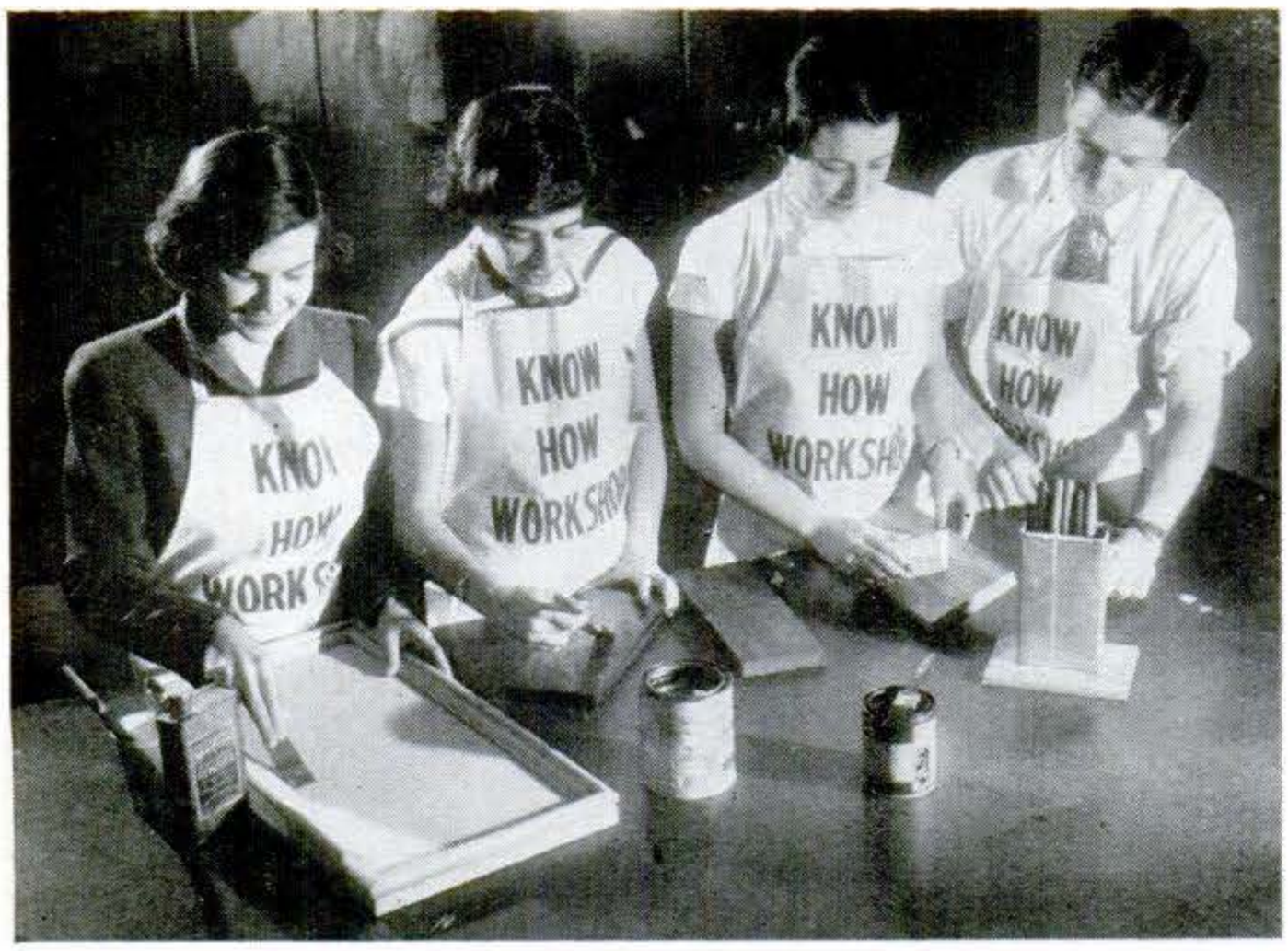

Old paint is removed and new finish is applied to scrap wood in schoolroom. These women will refinish furniture later on.

This woman is learning how to improvise gluing clamps from pieces of sash cord and bits of wood, if necessary, to repair her kitchen stool when it threatens to come apart.

however willing and enthusiastic they may be about doing it.

"With no training, how can we accomplish anything as assistant 'handymen'?" two New York City housewives, Mrs. Grace K. Liebman and Mrs. Lillian Baldwin, asked themselves. So they decided they would learn by going back to school. This sounded simple, but it wasn't. When they inquired at private and public schools, they found the courses in carpentry, painting, plumbing, and allied subjects were too specialized and too long.

Dripping faucets are repeatedly "cured" at a big practice sink by students in the beginners course in reducing the plumber's bills.

Clogged drains are cleared, too. Most pupils rush right home to apply this new knowledge to stubborn fixtures in their own kitchens.

"Why not start our own school?" they decided finally. "Only it will be a workshop rather than a school, where housewives like ourselves can be taught how to cope with everyday home problems."

News of their plans spread rapidly. Even women they did not know called Mrs. Liebman and Mrs. Baldwin.

"Count me in!" said one. "I'm being driven crazy by a clogged drain in my kitchen."

"Will someone show me how to patch some horrible nail holes in my living room wall?" inquired another.

With the encouragement and backing of their husbands, the two promoters rented a large loft over a movie theatre at Broadway and 66th Street. Then they visited the industrial-arts department of a local university and arranged for the spare-time services of several licensed teachers of general shopwork. With the advice and assistance of these experts they bought tools and supplies and had the loft fitted with benches, plumbing, wiring, etc. Starting from scratch, with only an idea and an empty room, they had spent about $1,000 by the time they were ready for business last spring.

Called the "Know How Workshop," the new school caught on quickly. In fact, at

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Electrical repairs are taught at this bench, which has a series of outlets and an abundant supply of appliances to be taken apart and put together again. Cutaway drawings are posted above the bench. Woman nearest instructor is Mrs. Lillian Baldwin, co-owner of the school.

the beginning Mrs. Liebman and Mrs. Baldwin were so busy handling inquiries and visitors that they had to take their own instruction piecemeal. They charge only $30 for an eighteen-hour, four-and-a-half week course, including the use of all tools and materials, and they figure that they are just about breaking even.

Classes are kept small (eight or nine at the most) so that the instructors can give personal attention to all. There are morning, afternoon, and evening sessions, each two hours long. Teachers assume that the students don't know the difference between a nail set and a hair set, and carefully identify and demonstrate the correct way to use even common hand tools.

"Most of these women have done a lot of sewing or knitting and they have marvelously deft fingers," says one of the instructors. "Once they get the feel of the tools they become very skillful in using them."

A simple lesson on knife sharpening sometimes has profound effects. "I spent ninety-eight cents for an oil stone and fifteen cents for a can of oil," reported one student, "and touched up three dozen assorted knives that have been used for 15 years. Now my family thinks I am buying better cuts of meat or becoming a better cook, because everything cuts so easily and feels so tender."

Men are not barred, but only one man has enrolled and he soon dropped out. He was a chap who had, as he said, two left hands, and the women were doing so much better he was afraid of getting an inferiority complex. END

Tricks of loosening windows and replacing sash cords that disappear inside the framework are learned on this dummy window casing.

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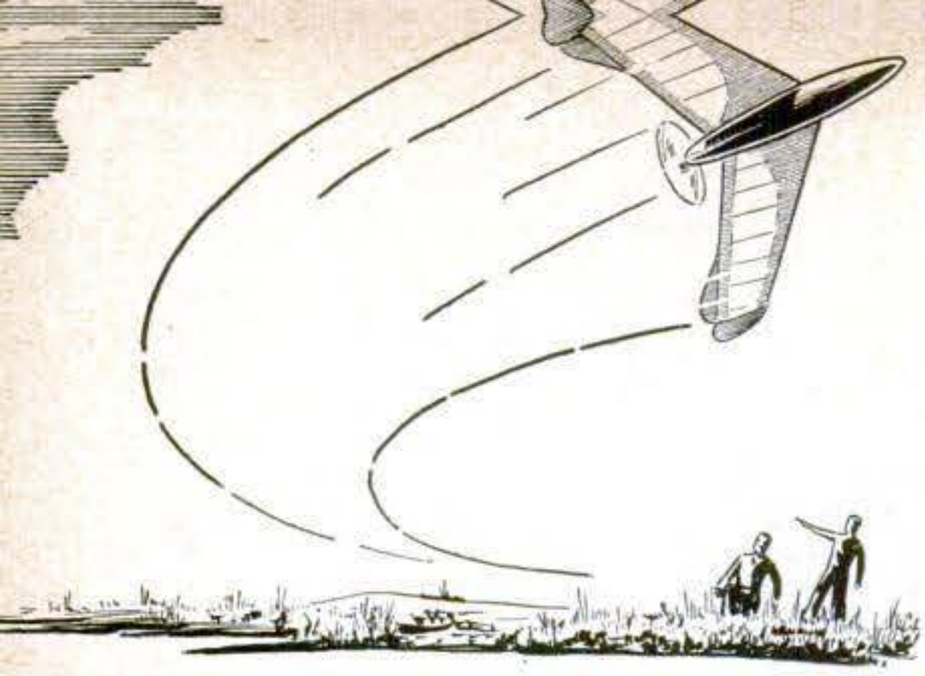
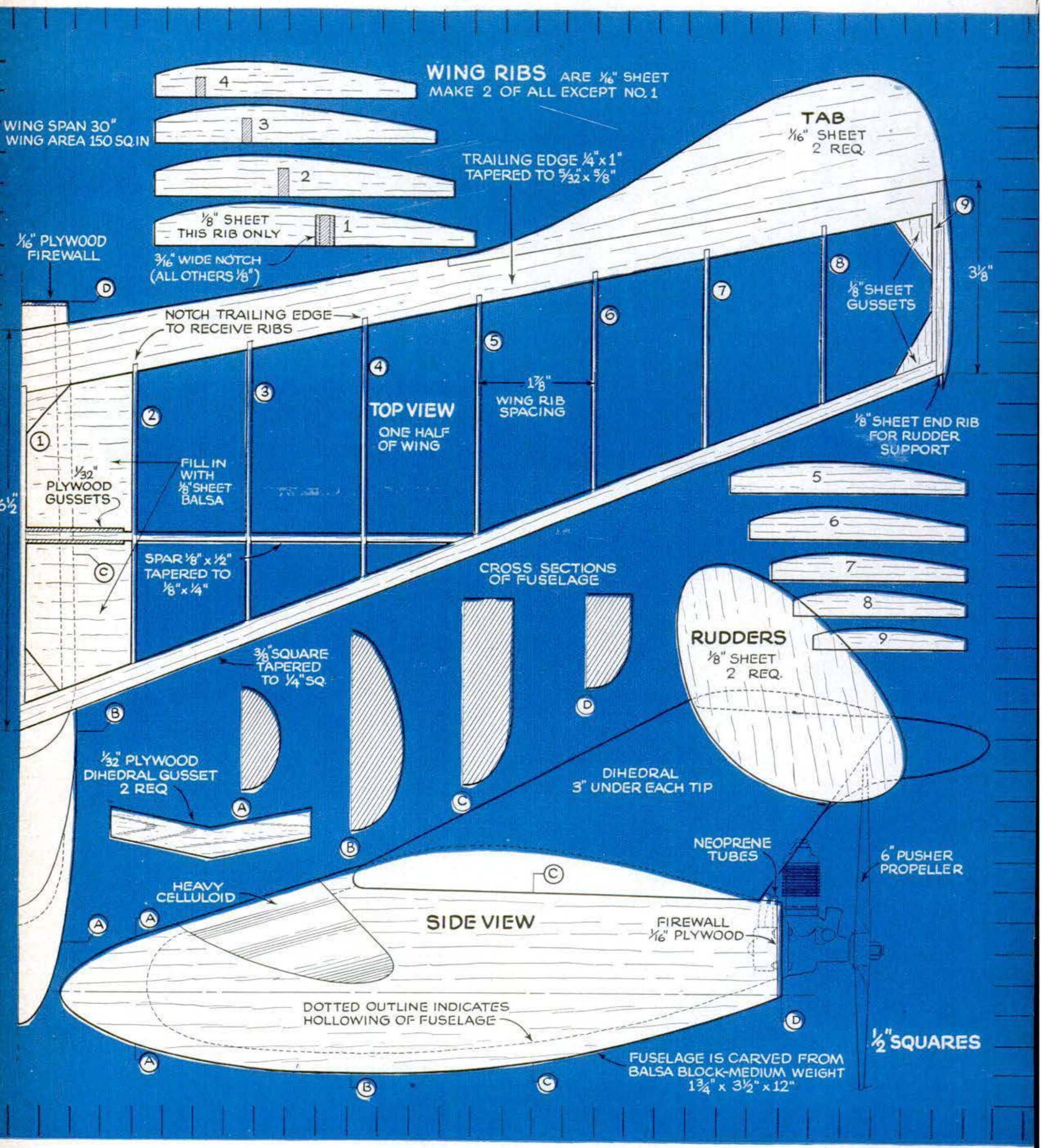


A Flying Wing You Can Build



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Designed for sport flying, this streamlined pusher model has speed and plenty of range.

By Paul Mueller

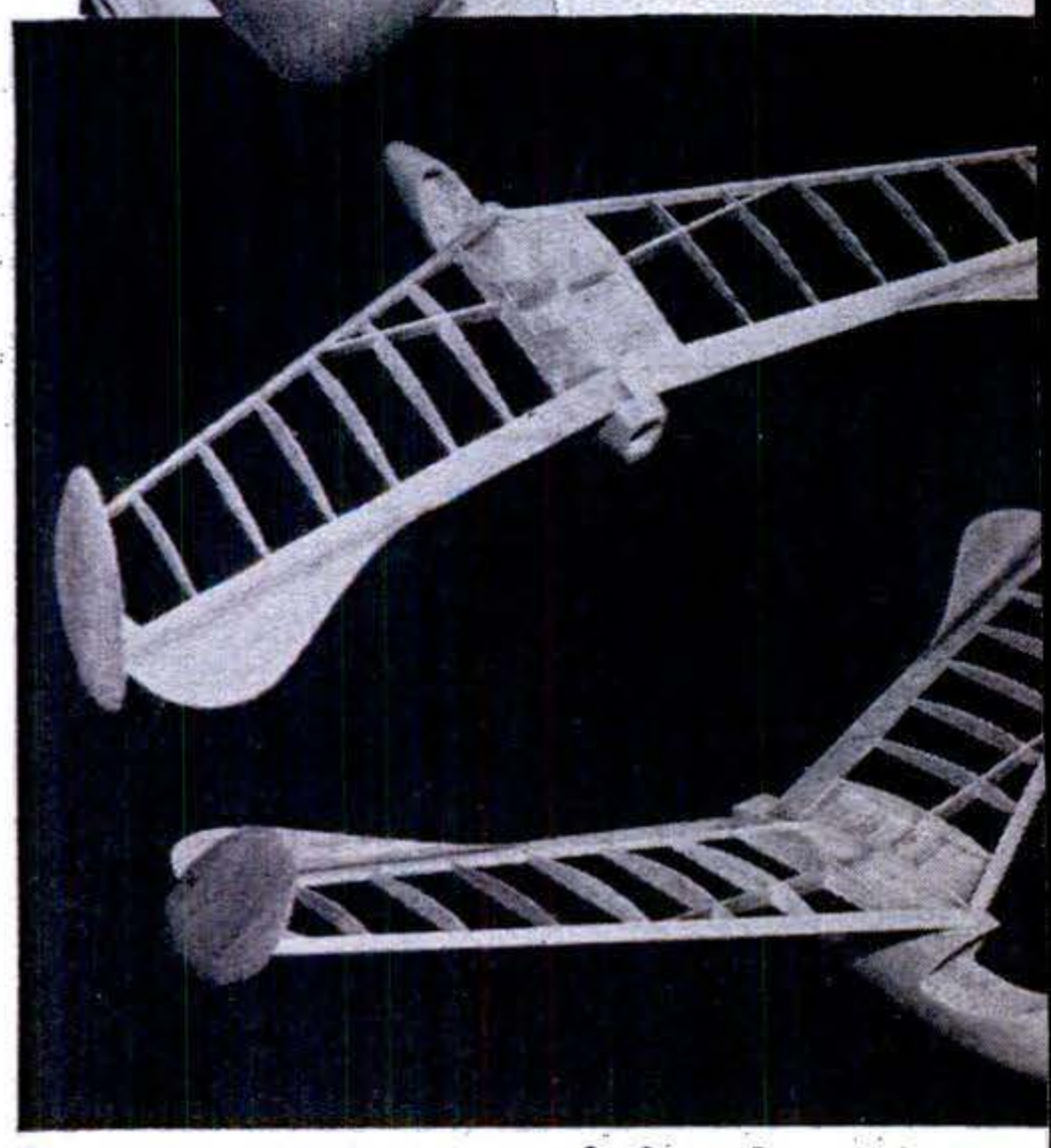
WHEN you get through building this flying wing, you'll have a hot plane to fly. Fast, flat glides, due to its drag-free, streamlined design, may be compensated for by a slight right turn in the rudder. If it shows diving tendencies, bend up the trim tabs. Try it under power. If it tends to loop, warp the tabs down a little. Properly adjusted, your flying wing should climb to the left in a wide circle until the motor cuts, then swing into a right circle glide.

Start construction with the wing. Use the best quality balsa you can get. Lay out the parts from the drawing on the opposite page. You can taper the leading and trailing edges of the wing by planing. The spar—mainly for dihedral bracing—also is tapered by planing. Cut the wing ribs, two of each, from 1/16″ sheet balsa, except the No. 1, center rib, which should be made of ⅛″ stock. Also cut two ⅛″ end ribs shaped like No. 9 ribs, but slightly longer to span the wing edges.

Cut spar notches only in ribs 1 to 4, as shown on the drawing. Notch the trailing edge of the wing so the ribs fit tightly in place. This will avoid warping when the wing is covered. Lay the leading and trailing edges and the spar in place on a flat surface. Cement the ends of the spar to the leading edge. Then cement all the ribs in place except No. 1.

Meanwhile, cut dihedral gussets out of 1/32″ plywood to the angle shown. When the wing cement has dried thoroughly, cement the plywood gussets in place to obtain the proper dihedral. Then cement in the center rib, the corner gussets, and the rudder supports, and fill in to rib No. 2 with ⅛″ sheet balsa as shown in the photos. Sand the leading edge so it fairs into the airfoil of the ribs and sand the complete wing.

Now you're ready to add the tabs and cover the wing. Run the model-plane tissue with the grain along the span of the wing, spray with water, and let it dry. Apply three coats of clear dope and a coat of fuel proofer.



Two views of the plane—before the wing was covered—show construction details. All ribs must fit flush at both leading and trailing edges so that skin will cover the frame smoothly. Note that inside of both rudders is sanded flat, while outer surfaces are curved.

Now for the fuselage. First cut the side outline and top outline. Then round it off. Hollow out the fuselage by gouging or burning. The top and cabin are open, so you can work through these to hollow the interior. Finish the fuselage by fine sanding. Give it two or three coats of a mixture of clear dope and talcum powder, sanding between each coat. This gives a glasslike finish that takes a good paint job. Next cement the wing to the top of the fuselage and the rudders to the wing tips.

For power, a Baby Spitfire or similar engine is bolted to the firewall and cemented to rear of the fuselage. The 6″ pusher prop can be bought at most model stores. END

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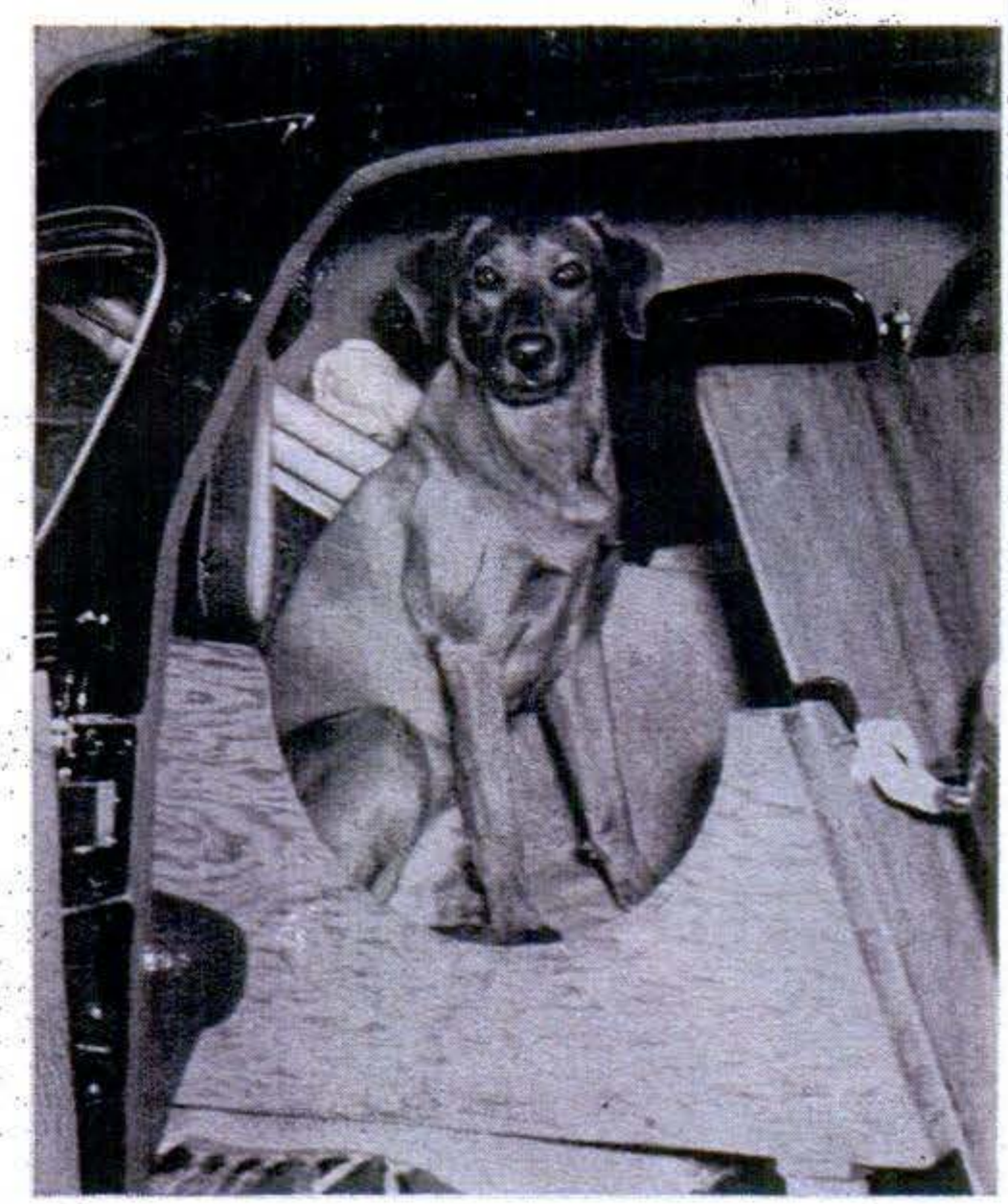
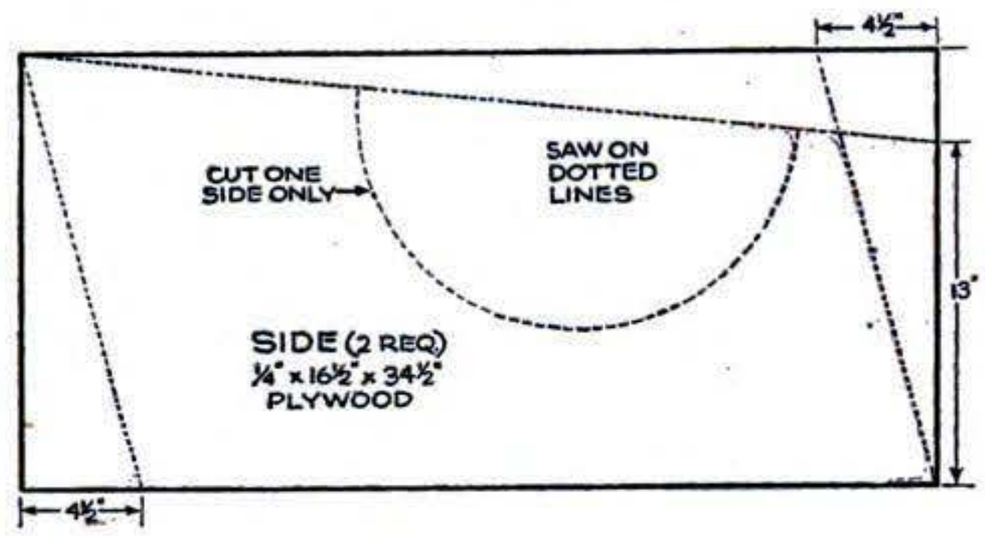
Back-Seat Box Satisfies Dog



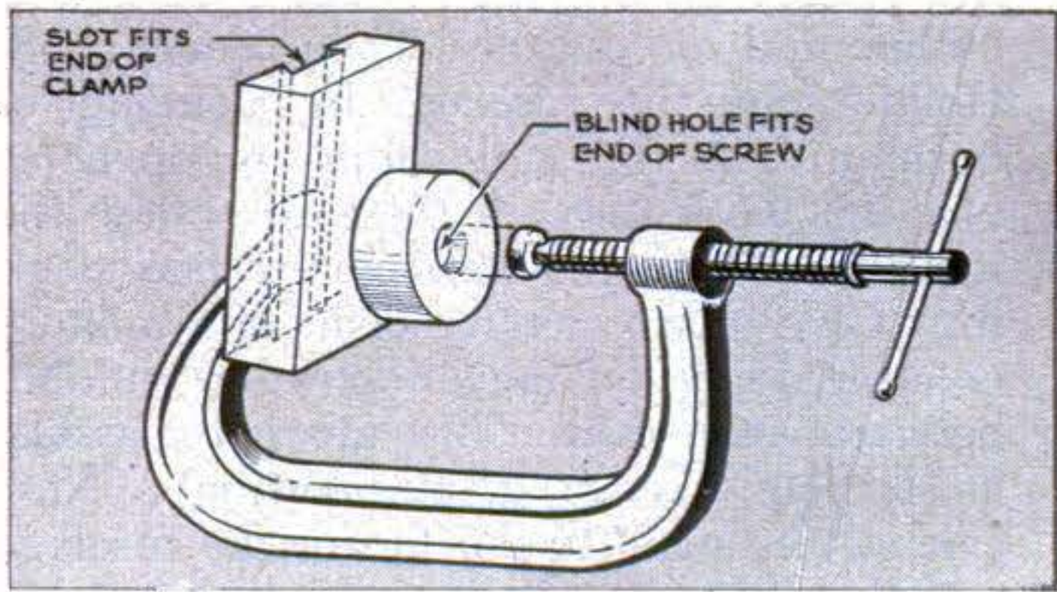


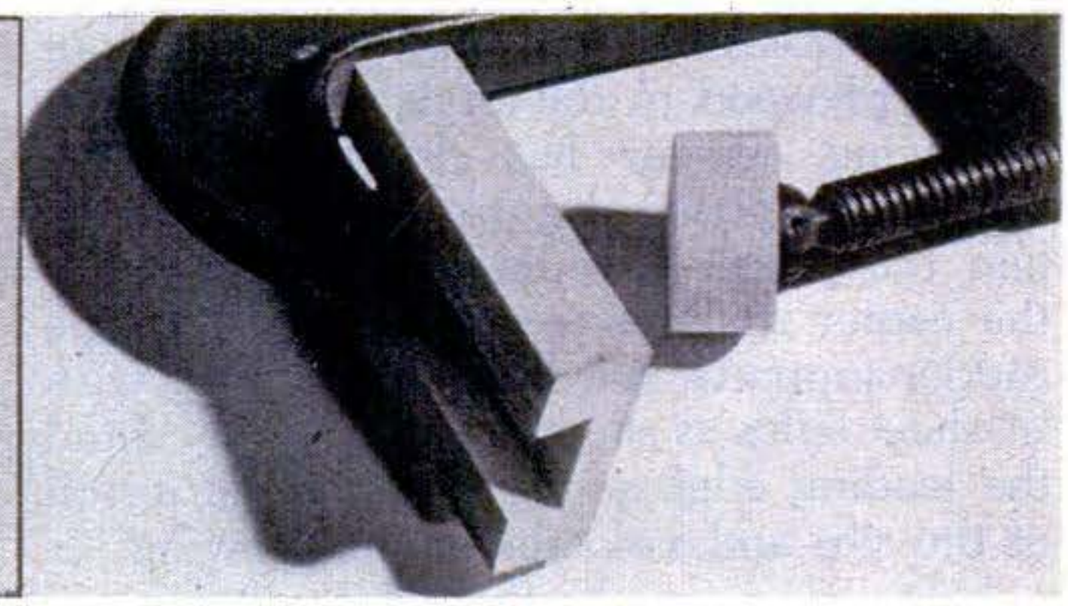
A PLYWOOD box in the back seat will protect the upholstery while you are traveling with your dog, and will keep him comfortable as well. Our yellow Labrador rides in the box shown, and he seems to like it.

For a smaller dog, you could make the box narrower, although it's advisable to provide enough space for him to lie down. The suggested dimensions may require some changing to suit your car. Assemble the parts with small screws countersunk a bit.

The two legs that support the front of the box are hinged to the box. This makes it easier to get the box through the door. A roll of canvas under the back edge of the box keeps it level. A pad of old blankets covered with canvas fits into the box. To keep the dog from the front seat, we clamp a piece of plywood to the front of the box.—*Ruth Hodgson, Eagle River, Wis.*

Protective Pads Won't Fall Off Clamp Jaws





PIECES of wood placed under clamp jaws to protect the work have a habit of slipping as you set the clamp. The protective pads shown above will save you that annoyance.

Make them of softwood. In one, bore a hole for a snug fit over the screw jaw. In the other, cut a slot so the block will be a tight press fit over the stationary jaw. The trick works equally well on a C clamp.—*Herbert Pfister, The Bronx, N.Y.*

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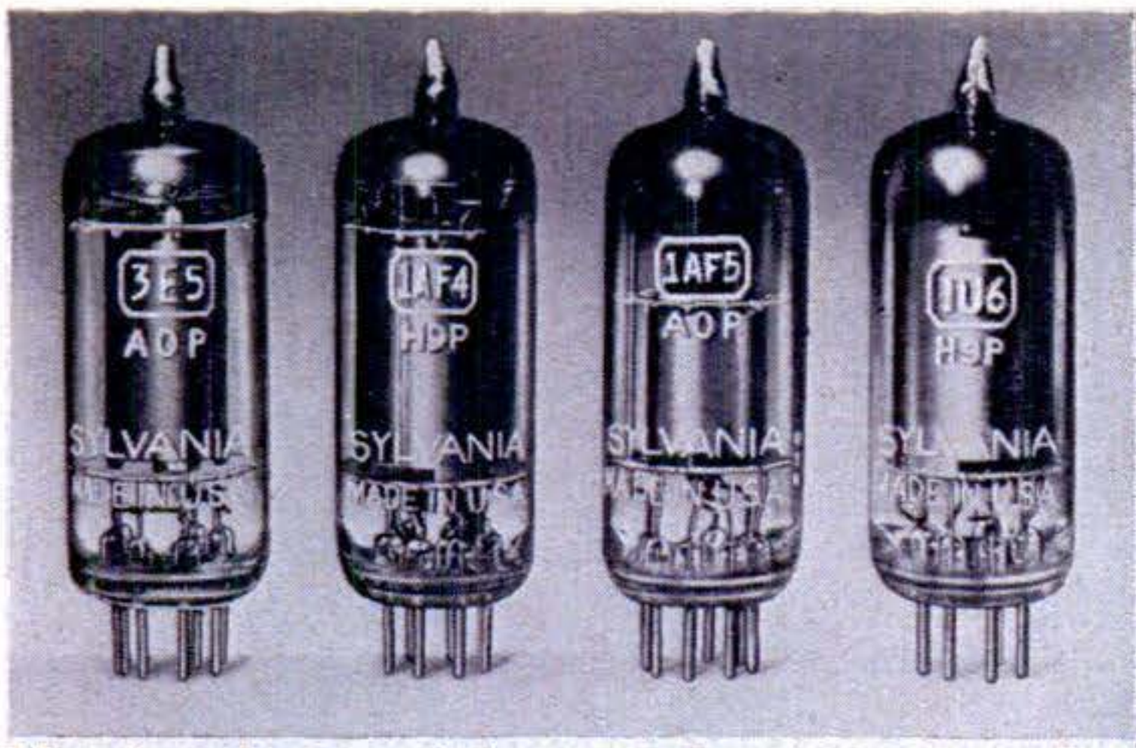
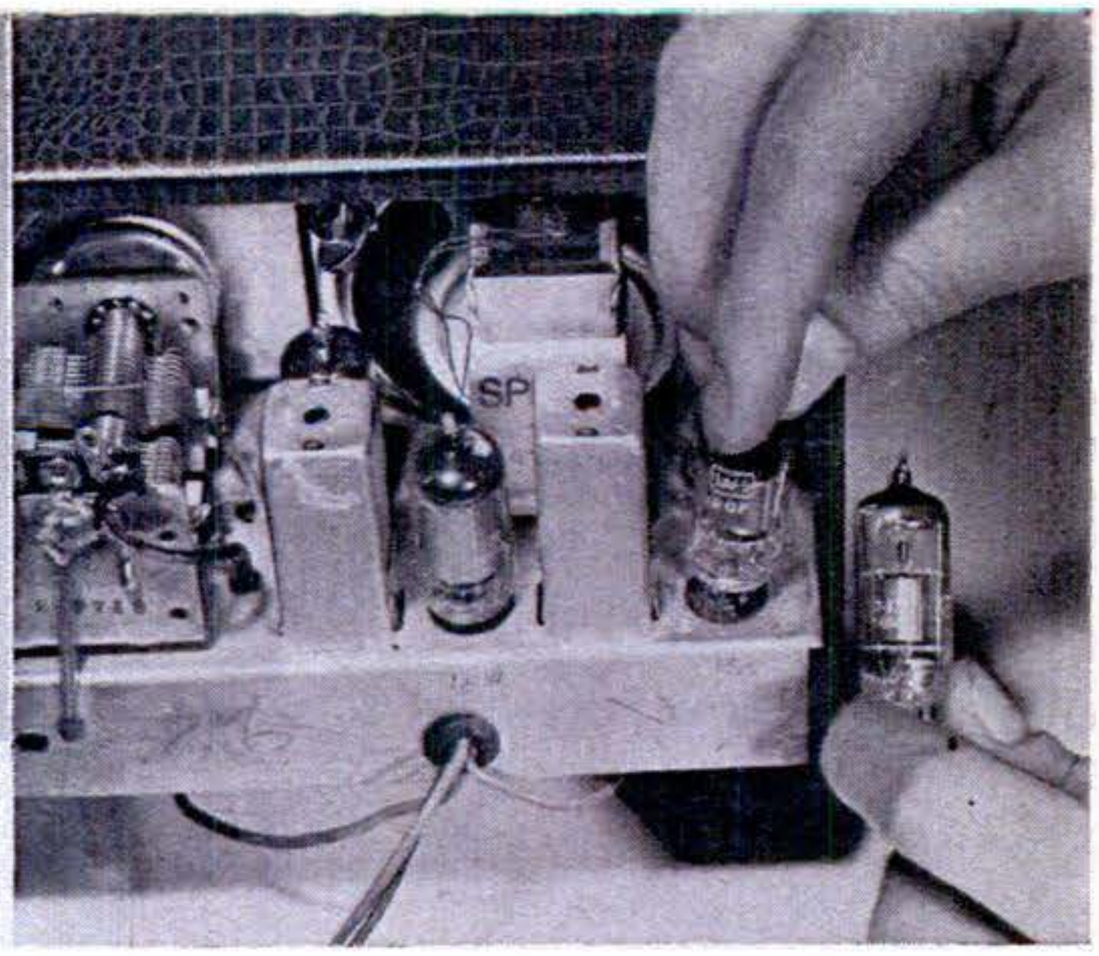




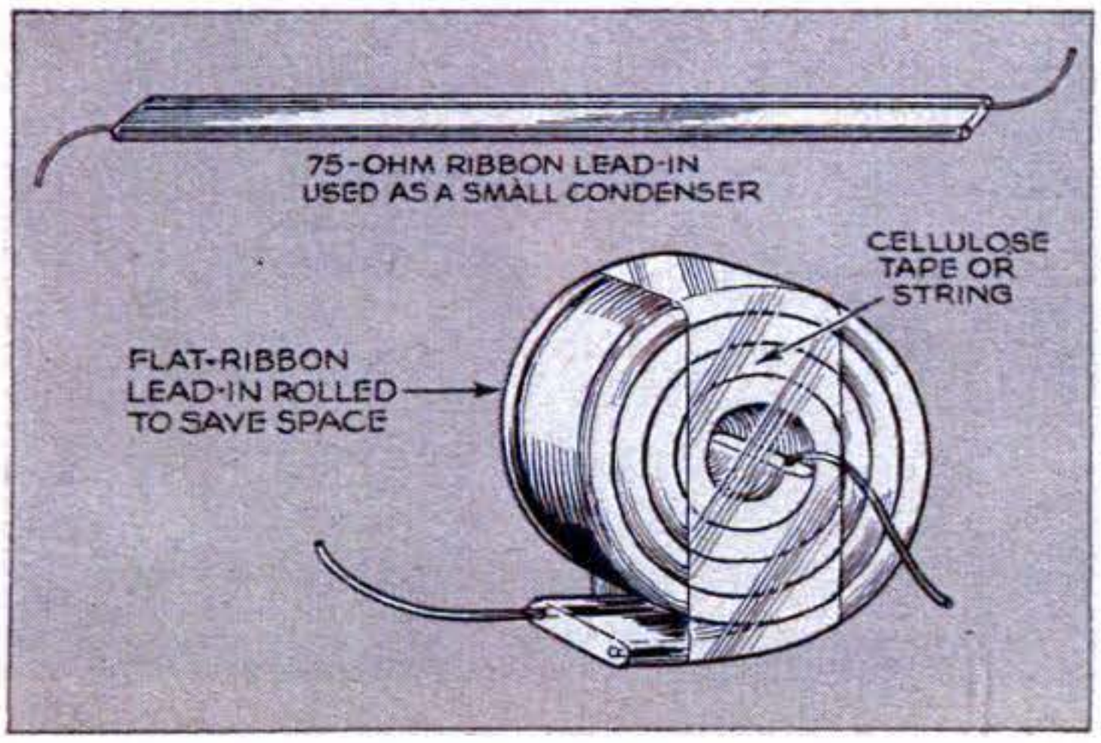
The low-drain miniature tubes are pictured above. In portable at right, a burned-out 1S5 was replaced by a 1AF5. The set works as well and flashlight-cell A supply lasts longer.

New Radio Tubes Save Batteries in Portables

NEW types of 1.4-volt miniature tubes that draw only 25 milliamperes of filament current may triple the life of A batteries in portable radios. Present 1.4-volt miniatures take 50 ma. Halving current consumption triples useful battery life, according to Sylvania Electric, makers of the tubes.

Three of the four new types have the same pin connections as present tubes and may be interchanged with them in many cases. Greatest battery saving is obtained when all four are used.

The new tubes are the 1AF4, an RF pentode similar to the 1U4; the 1AF5 diode-pentode amplifier, similar to the 1S5; the 3E5 power-output pentode, similar to the 3V4; and the 1U6 pentagrid converter, which has no equivalent.



Small Capacitors from Lead-in

ELECTRONIC experimenters working with high frequencies often need very small capacitors. It isn't easy to buy condensers of very low value, but you can make your own from coaxial cable and flat-ribbon lead-in.

These cables, widely used as television transmission lines, come in several impedances from 50 to 300 ohms. Most catalogues list impedances and also give the capacity-per-foot for each type. Capacities range from about 4 to 30 mmf. per foot.

By calculating the necessary length, you can turn scraps of transmission line into accurate capacitors of almost any low value. —*Arthur Trauffer, Council Bluffs, Iowa.*

The Height of Ingenuity

We were at the beach when one of the cars in our party broke down. The nearest garage was miles away. Even though we had another car, we had no tow rope. How do you think we towed the disabled car to a garage?

The kids were playing in the water with two inner tubes. We borrowed these, let the air out of them, and hooked the tubes over the rear vertical bumper guards of the good car and over the front guards of the disabled car. They served as a perfect tow rope.—Mrs. Floyd Marquette, Warren, Ohio.

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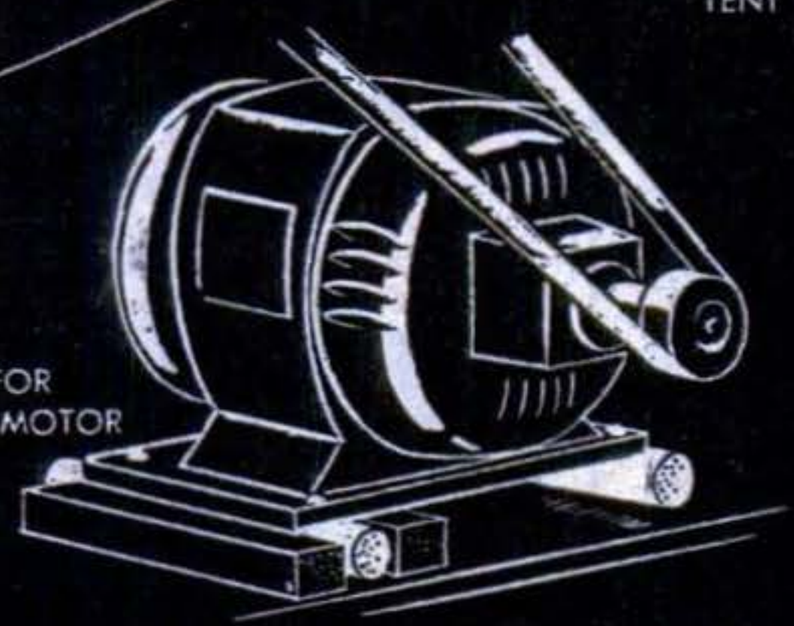
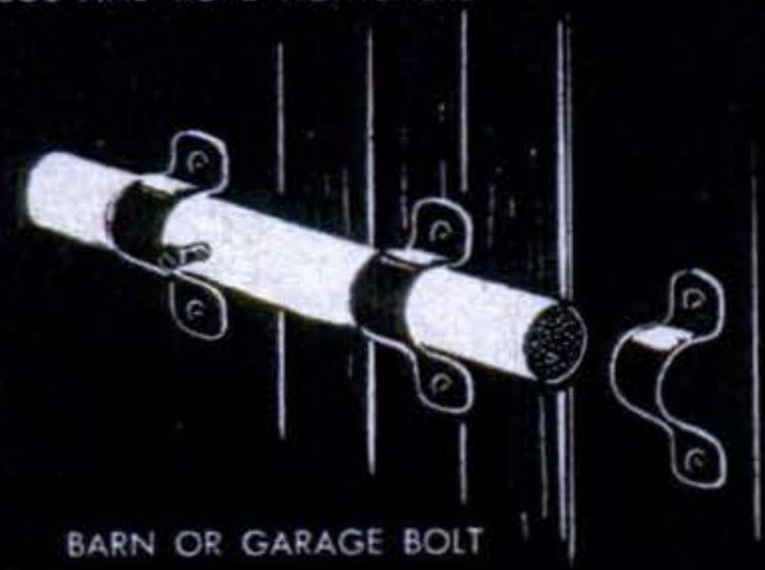
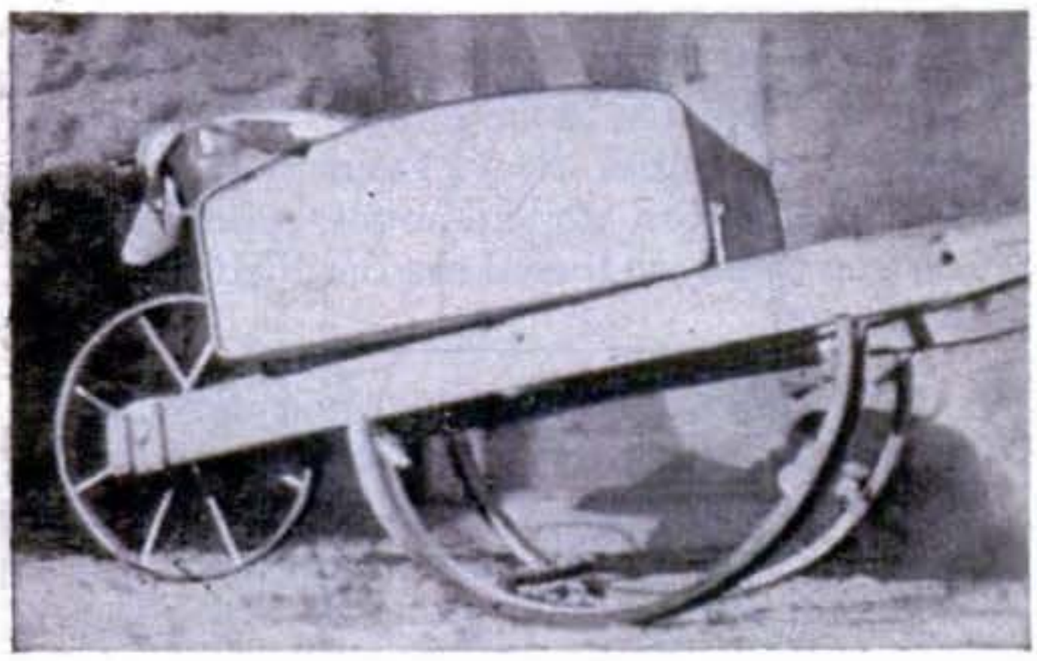
Use an Old Broom Handle

AN OLD broom may not pick up much dust, but its handle can clean up a lot of odd jobs. If you slice off a thin section of the hardwood handle, you have a wheel. Give the wheel an off-center axle, and it becomes a cam. Two lengths of broomstick make an excellent base for a motor that has to be moved from one machine to another. A few of the other jobs that an old broom handle takes in its stride are sketched below.





Wheelbarrow Built from Scrap



A MODEL-T rim and an old gas tank are the main parts of this homemade wheelbarrow. The wheel is from a worn-out barrow and the handles are two-by-fours. I hacksawed the rim in half and drilled holes in the ends for U bolts to anchor the halves to the two-by-fours. The rim was cut so the four lug-bolt holes could be used to attach cross braces. After the top of the tank was chiseled out, the tank was bolted to the two-by-fours.—*Howard L. Corwin, Rhame, N. D.*

Blowtorch Colors Wood

AN INTERESTING, semi-natural wood finish can be obtained without using color or stain by "toasting" the wood with flame. Use a blowtorch or a gas or coal flame and blacken the wood evenly all over. Scrub off loose char with a fine wire brush and apply varnish or shellac.—*J. E. Bird, Carrollton, Ill.*

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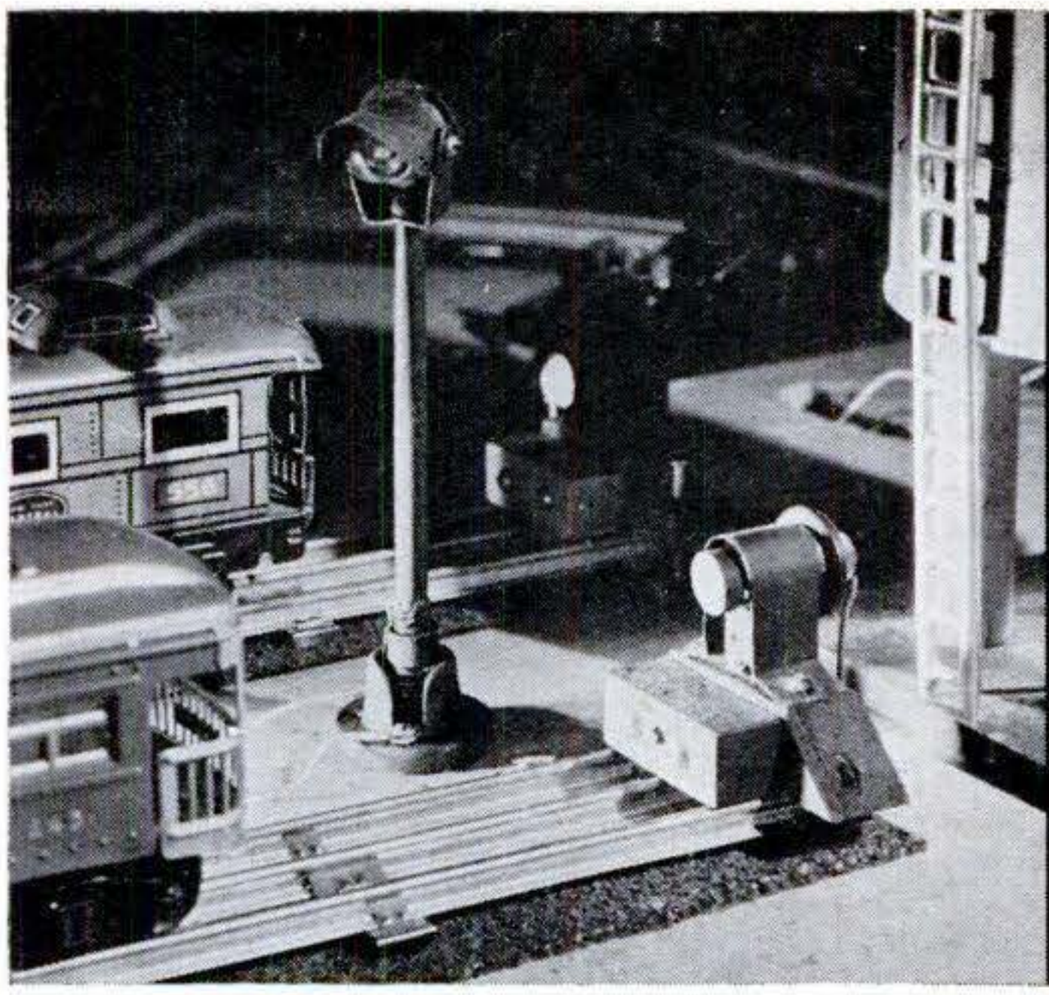
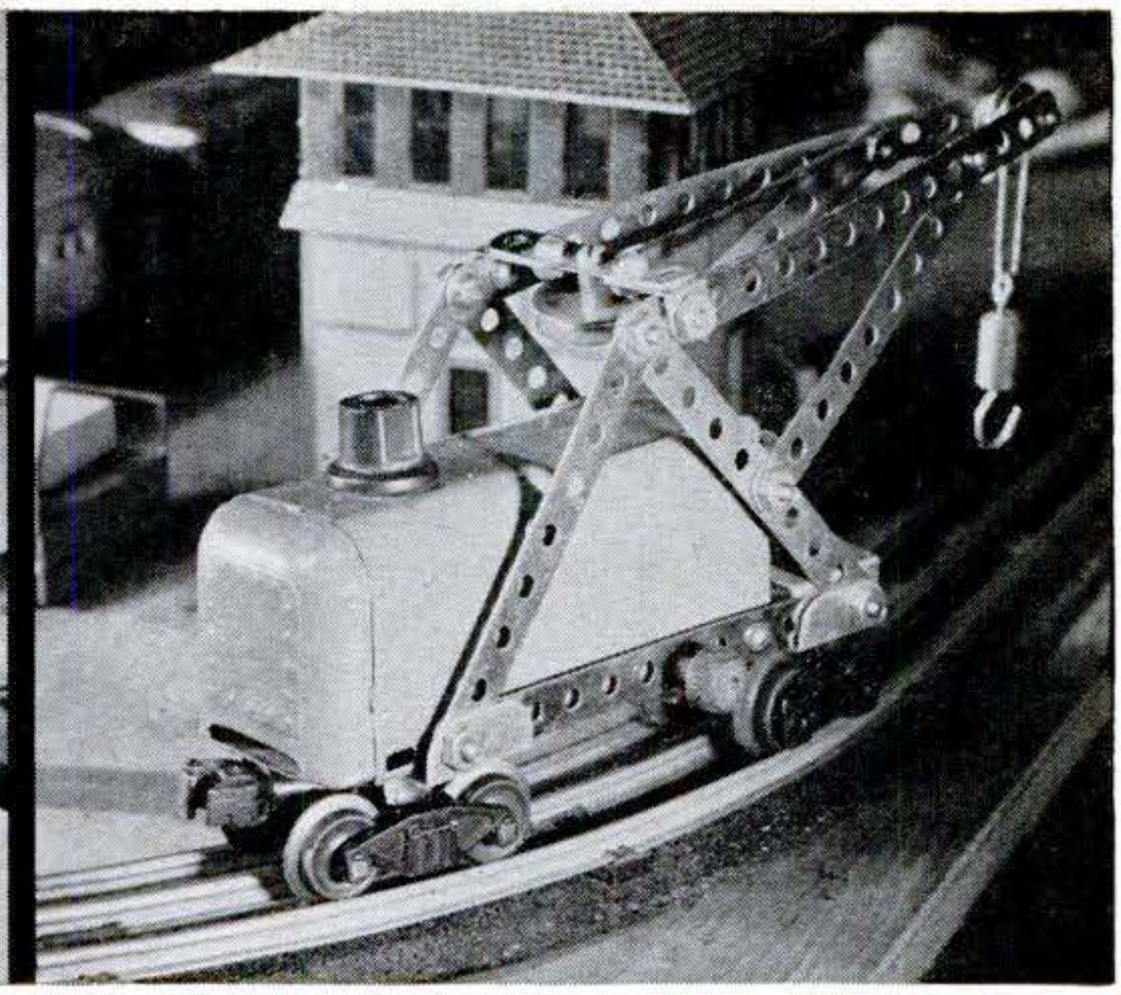
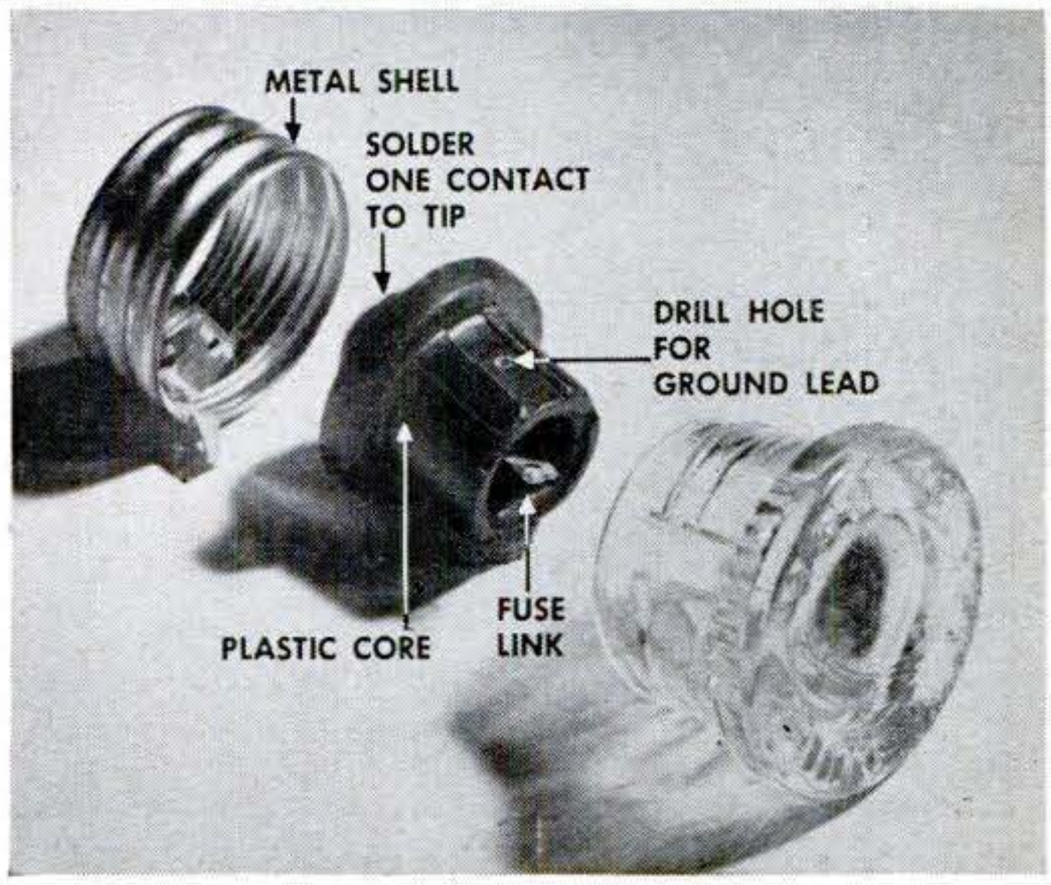




Old Fuses Can Dress Up Your Model Railroad

MODEL rail layouts can take on new luster if you examine your burned-out fuses before throwing them in the ash can. The molded-plastic centers of some fuses have hollow cores that make excellent receptacles for miniature lamps. You can easily put them to work as rail-type lamp sockets, end-bumpers, yard floodlights, block signals, and the like.

Examples of the first two types are shown at the upper left. To make a socket, unscrew the threaded metal shell of a fuse and lift out the core. Bend down the remnant of the fuse link inside the plastic center, and solder one wire to the contact tip of the fuse. To make the second connection, drill through the side of the core, slip a wire through the hole, and loop it around the base of the bulb.



The massive appearance and dull black finish of the molded centers suggest other uses in model work. The dummy stack (upper right) was mounted on the cab roof by drilling a hole to fit and cementing the plug in place.—*Carlton Bucher, White Plains, N.Y.*

Ring Locks New Tripod Head

A THREADED ring adjusts the tension against the swivel ball of the new Tip-Top tripod head, made by the B-T Company, Inc., of Milwaukee. It has a 360° horizontal swing and a 180° vertical swing. Turned from aluminum bar stock, the head is suitable for small- and medium-size cameras. The lower of the two rings fastens it to the tripod. The head sells for about $2.

Starting Flooded Outboard

IF YOU can't start your outboard because the carburetor is flooded, try this: Shut the needle valve, and then crank the motor. If the trouble is due to flooding, it will often start on the second or third pull. As soon as the motor catches, set the needle valve to its normal position.—*L. S. McCready, Kings Point, N.Y.*

Scaffold on Truck Saves Time

WHILE putting new siding on our two-story shop, we hit on the idea of building the scaffold on a truck. Then we simply drove the truck around the shop. It saved a lot of time and material.—*Nate Schoenbrun, Scranton, Pa.*

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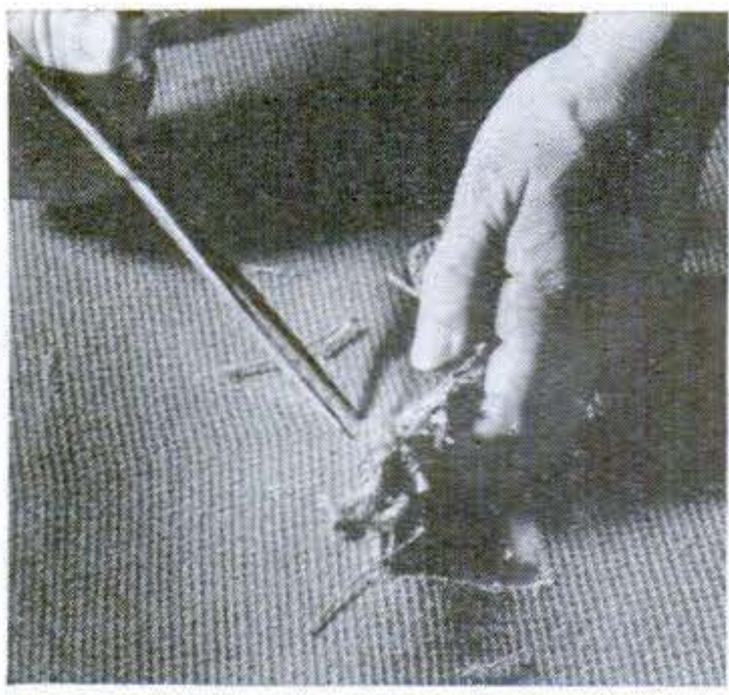
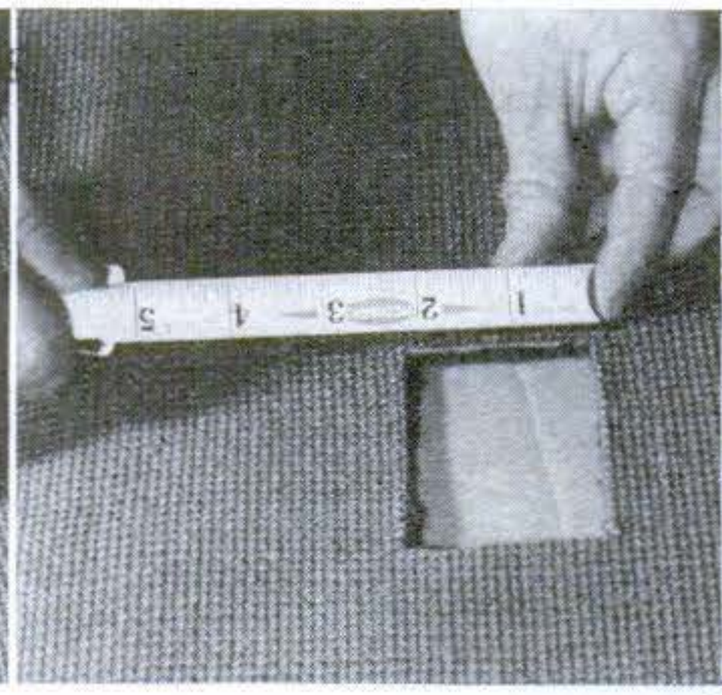
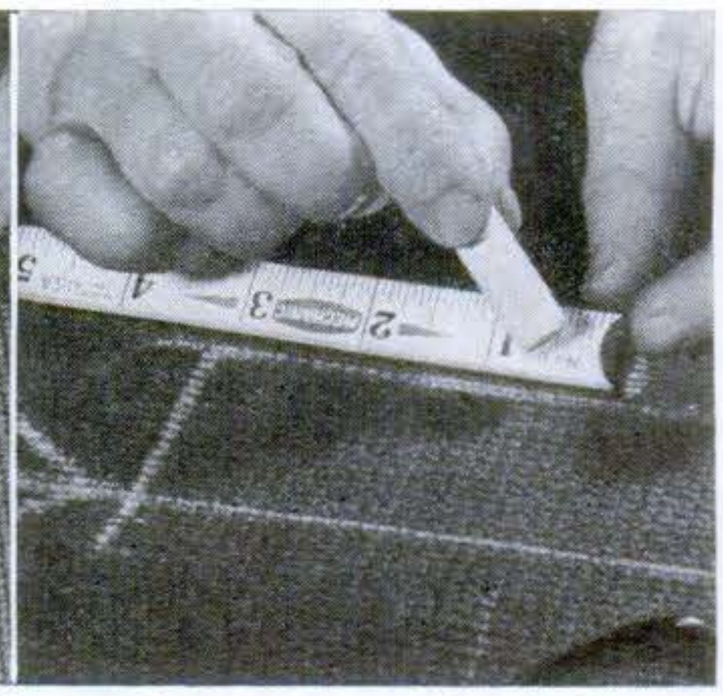
Ugly worn spot looks like major repair job, but fitting almost invisible patch is not hard.

An Expert Tells You

How to Repair Your Own Rugs







1 **To repair a hole** or worn spot, turn carpet face down on floor. Trim away all ragged edges (left), leaving a neat rectangular or square hole. Carefully measure cutout area (center). Then lay out the dimensions of patch on a piece of matching carpet (right). Cut patch so nap runs in same direction as nap of carpet. You can tell direction of nap by running your fingers over carpet. If it feels smooth, you're moving with nap; rough is against nap.

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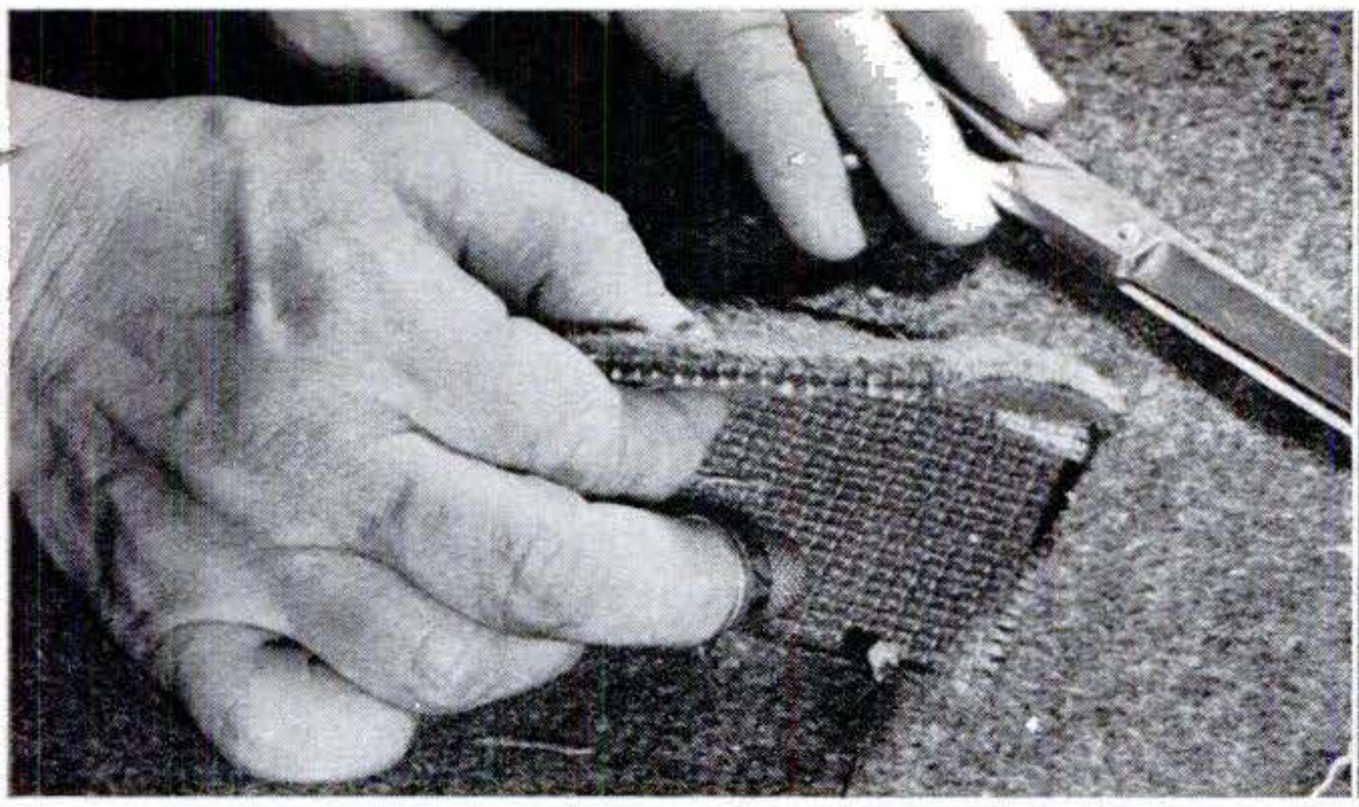
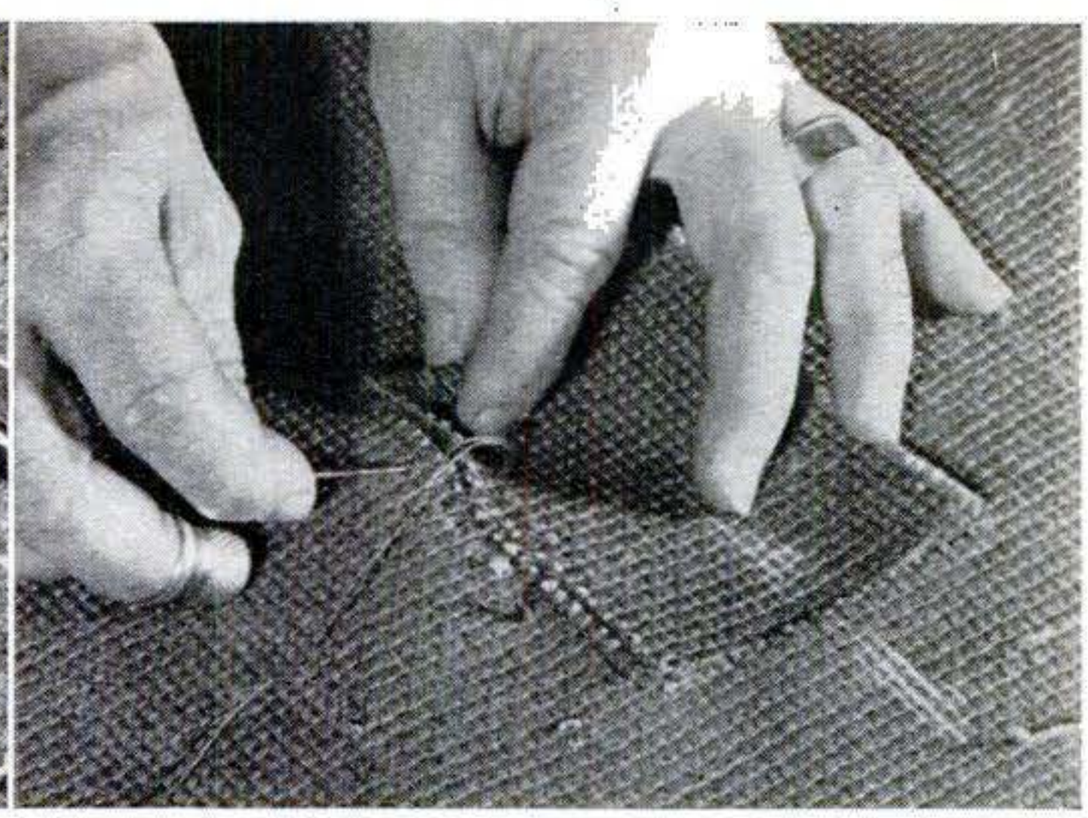
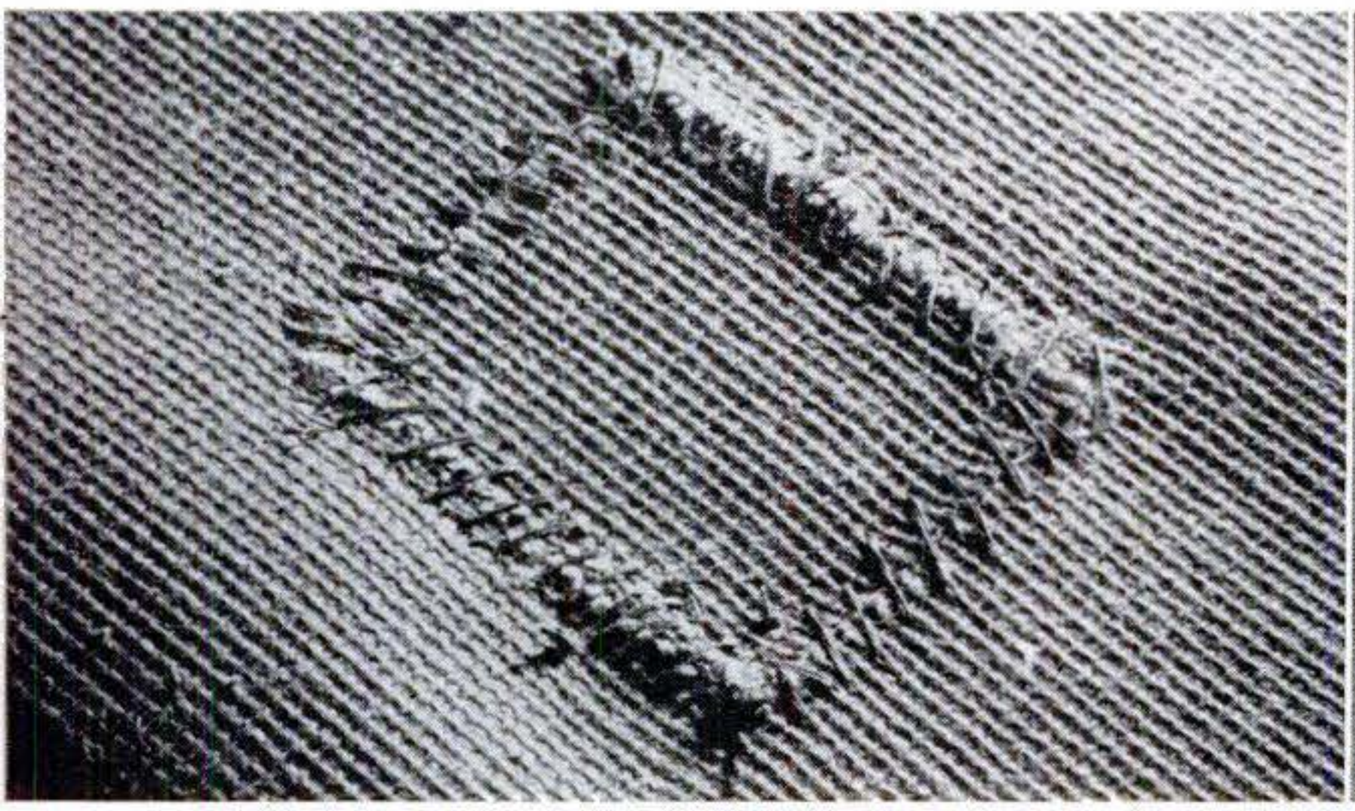




2 Make sure patch is accurate fit (left), trimming edges of opening or of patch to make **seam smooth. Fitting of the patch is done from** top of carpet. With carpet turned over (right), sew patch with whipstitches. Don't run stitches all the way through the carpet.



3 From underside of carpet, completed repair job looks like this (above). Turned right-side up, it's hard to tell patched area from rest of carpet (above). Whipstitches shown here are about ½" long so they overlap patch and surrounding carpeting by about ¼" each.

By Helen M. Klemm

PS photos by W. W. Morris

The author of this article, Mrs. Helen M. Klemm, is as much at home repairing a medium-priced throw rug as she is standing high on a ladder and re-weaving a huge, antique Flemish wall tapestry.

Mrs. Klemm has followed her profession both in the United States and in Europe. As a sideline, she attends auctions with her clients, advising them on rugs, needle point, and tapestries they intend to buy.

IF YOU can handle a needle and thread, you can mend your rugs and carpets. It's not difficult, but strangely enough I've run across very few housewives who've even tried their hand at this simple chore.

"Rug repairing is a man's job," they usually say, "and only a professional can do it. Besides," they add, "it's expensive."

Fortunately, none of those statements is true.

Any woman who can shift a sofa to clean behind it can pull a rug up on a table to rebind it. And it costs but little. To rebind all the edges of a 9′ by 12′ rug, for instance, will cost you less than $2. And that price includes all materials.

Check your rugs and carpets today for needed repairs. I'll show you how to mend holes and tears, rebind edges, put on new fringes, and make a curled-up corner lie flat.

Repairing holes. Besides being unsightly, a hole worn in a rug can be dangerous—you might catch your foot in it and trip. If yours is a solid-color carpet, the first thing to do is get a piece of matching material from a carpet store. Or you may have scraps left from the time the carpet was laid.

Turn the rug face down and enlarge the

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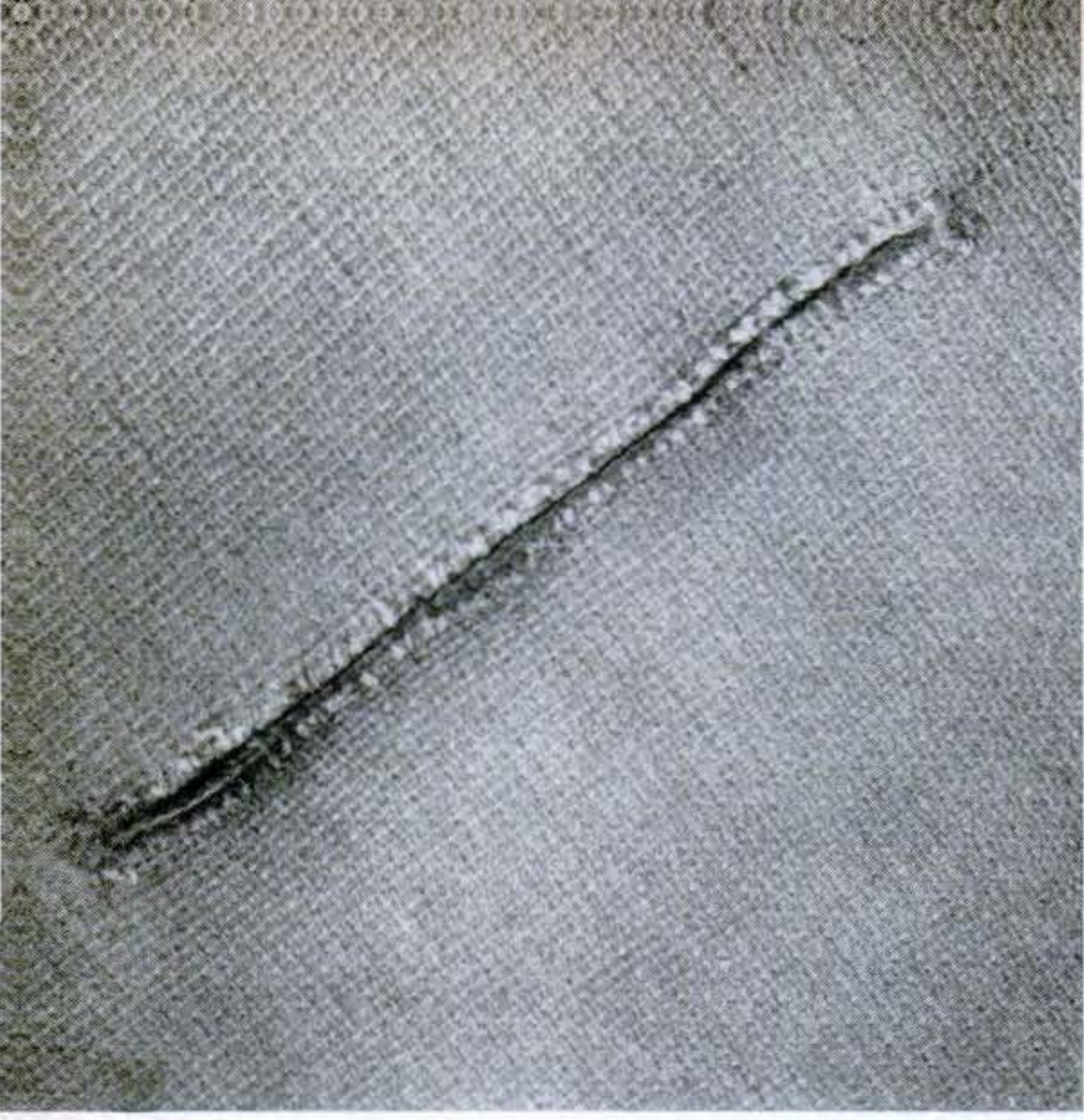


Rips like this start as breaks in body of carpet and at first can only be seen from back of carpet. Regular inspections of floor coverings catch breaks before they become bad. Working from back of rug, pull break together with whipstitches and seal with gummed edging (above).

damaged spot to a neat square or rectangular hole. A pair of shears will do the job. Then cut a patch to fit exactly. Use a strong steel needle and carpet thread. Sew from the back of the rug, taking close whipstitches about ½″ long—¼″ in the patch and ¼″ in the carpet. Don't push the needle all the way through the rug—just about half way through. Then the stitches won't show on the surface.

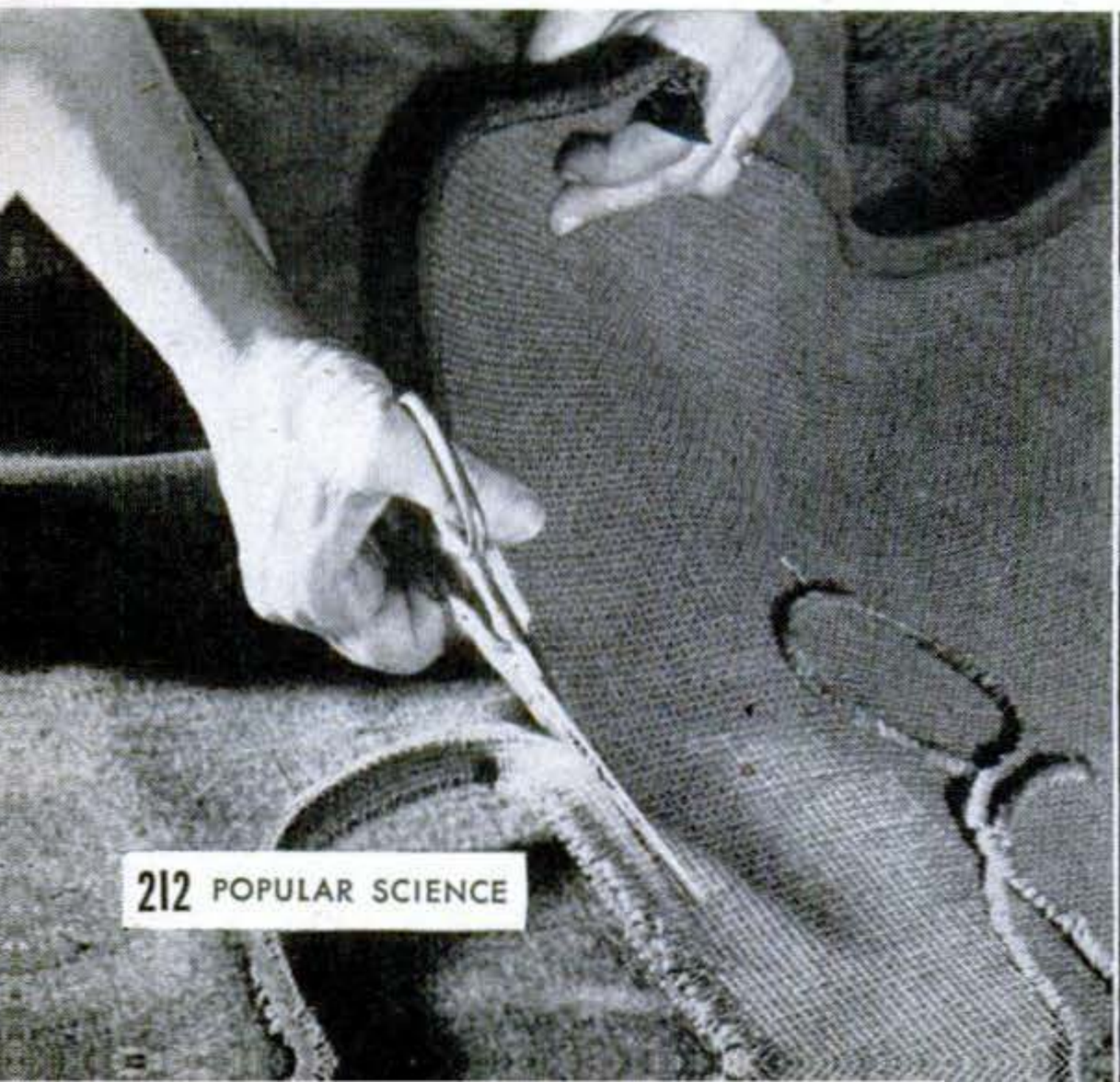
Mending a hole in a multicolored rug, unfortunately, isn't so easy. If the hole is a small one—about the size of a dime—you can do it. Large ones should be left to an expert. To repair a small hole, first sew a piece of embroidery or needlepoint canvas to the underside of the rug. Cut the canvas slightly larger than the hole. On the top of the rug, replace the lost pattern with small stitches of colored tapestry wool.

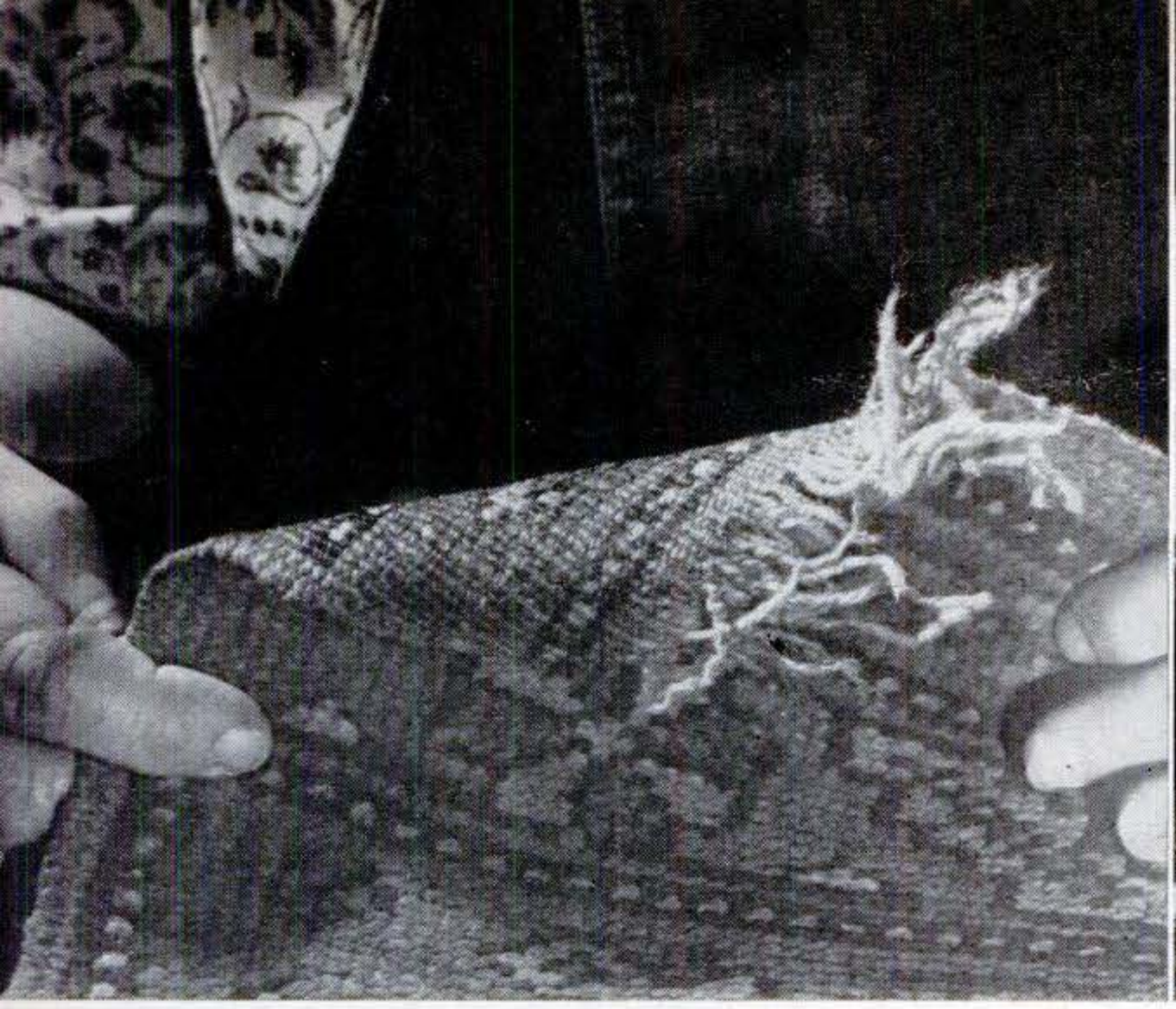
Repairing frayed edges. Worn edges are one of the most common rug ailments. Fraying usually starts in a path of heavy traffic, exposing the rug to dangerous unravelling.

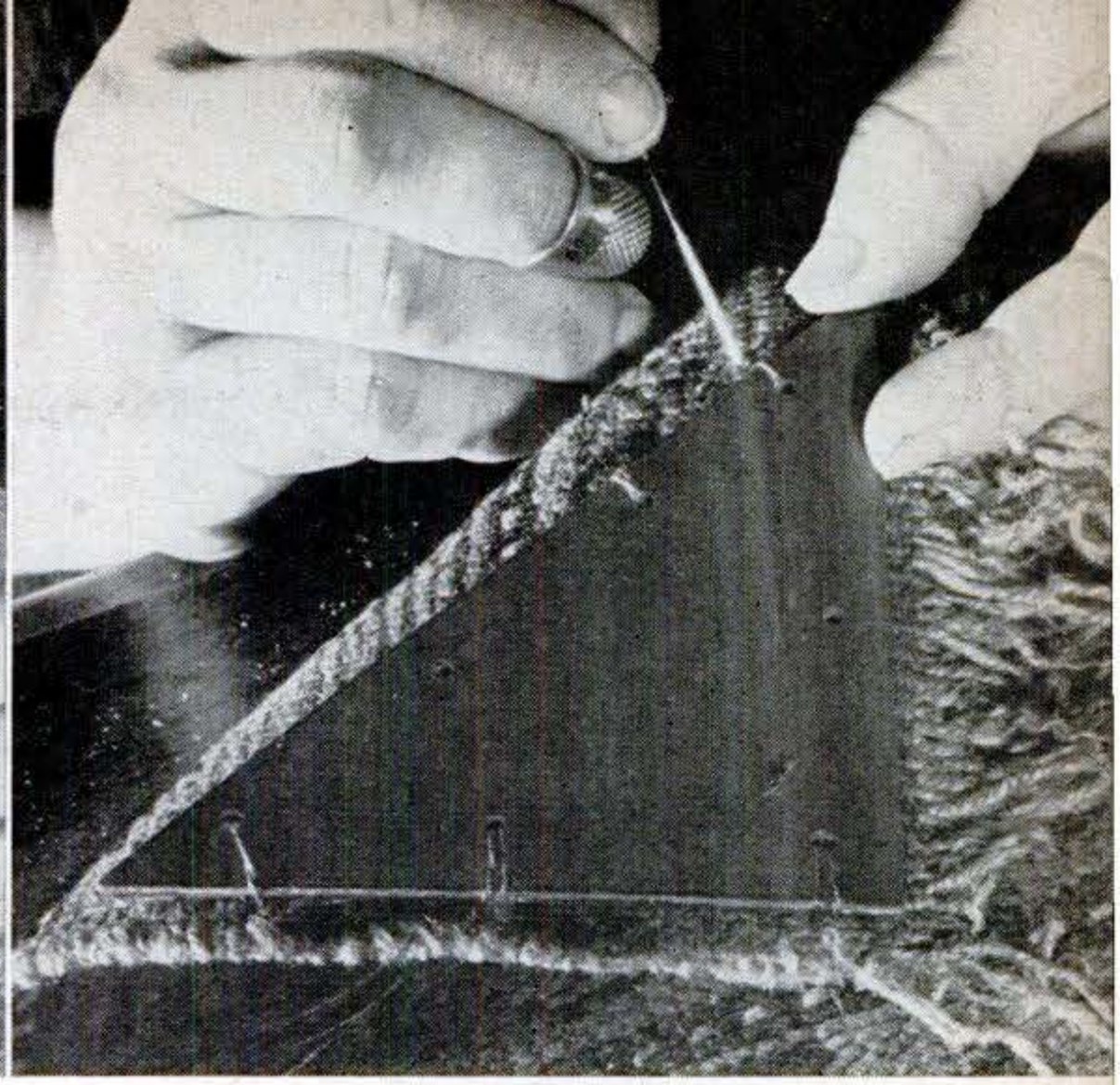
For this job, you need matching cotton binding, carpet thread, and a steel needle. Get enough binding for all four sides even though you intend to fix only one side. You might have trouble getting the same color binding at a later time. And allow a few extra inches when you buy the binding.

1 **When binding wears away** and edges of carpet begin to unravel, turn rug over and trim edge to a straight, neat line with scissors.

2 **Lay full width of new binding** on carpet's edge. Working from right to left, attach binding with narrow whipstitches, as shown.







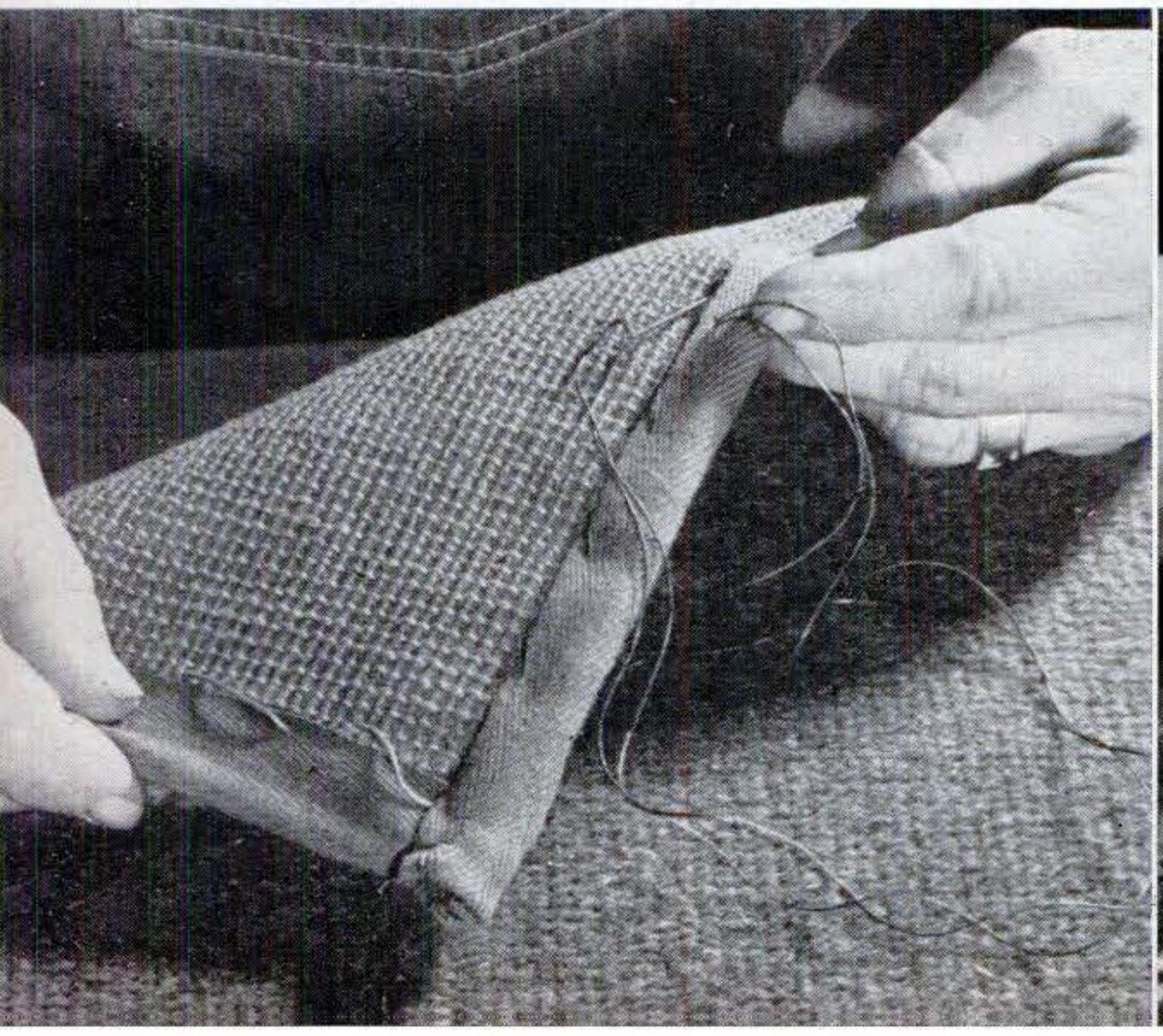
Rug corners that persist in curling up can be made to lie flat permanently with a simple triangle of plastic. Anti-curl corners are thin and stiff and have holes along all three edges. Sew one to the underside of a curling corner (right) and the corner will lie flat.

With the carpet face down, trim the edge to a straight line. Then turn the carpet face up. Lay the binding along the edge of the carpet. Fold under a ½″ or so at the corner and whipstitch the edge of the binding to the edge of the carpet. When you've sewn all along one edge, turn the binding firmly under the carpet's edge and sew the binding to the underside of the carpet with big stitches. Do not run these stitches all the way through.

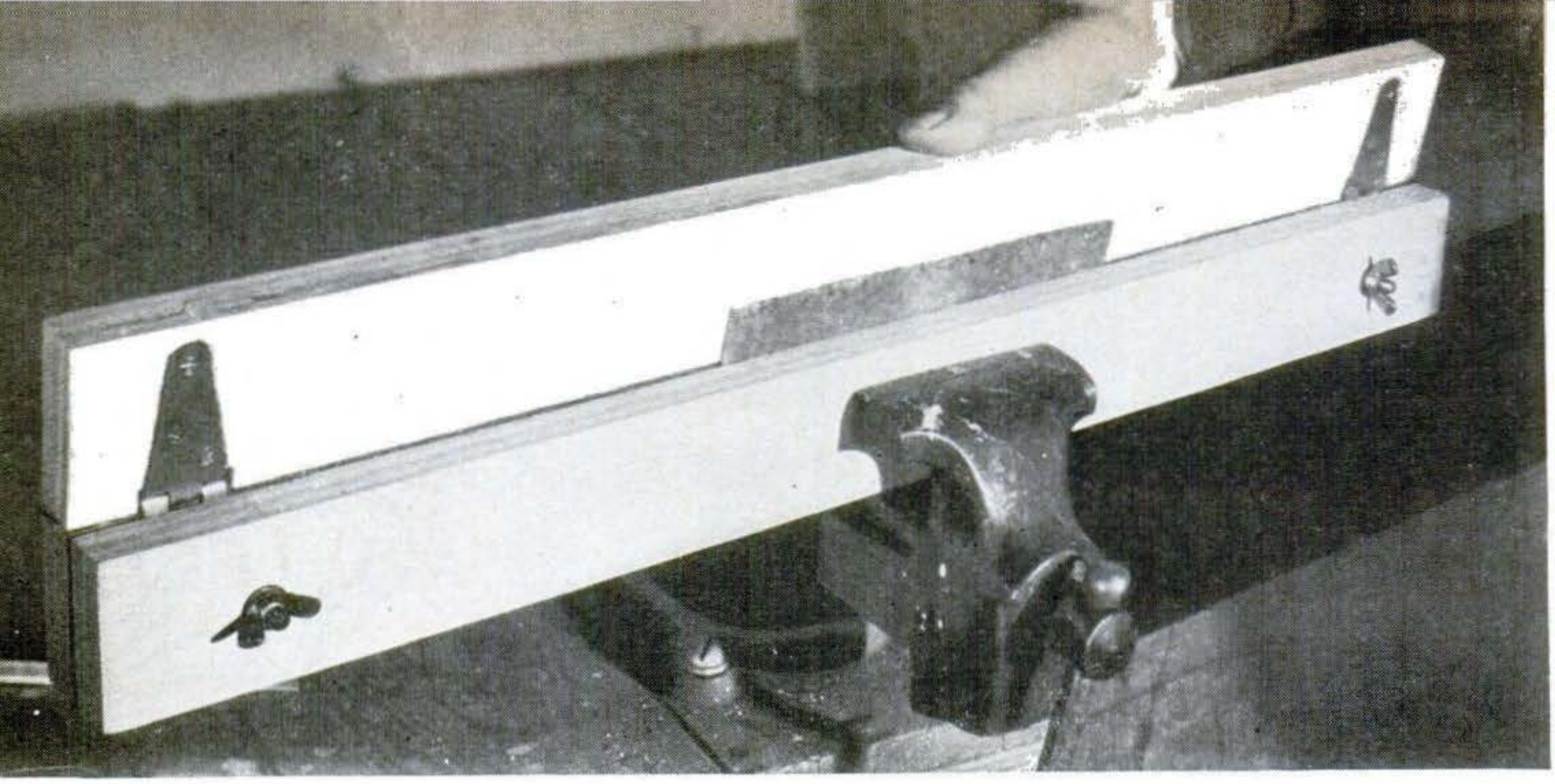
New fringes. When your rug looks untidy because of worn fringes, detach the old material. If the edge of the rug is not even, trim it to a neat edge. Overcast the edge with linen thread to stop further unravelling. Buy a doubleheaded fringe. This has a double strip to which the fringe is attached. Sandwich the edge of the rug in the double strip and sew it to the rug.

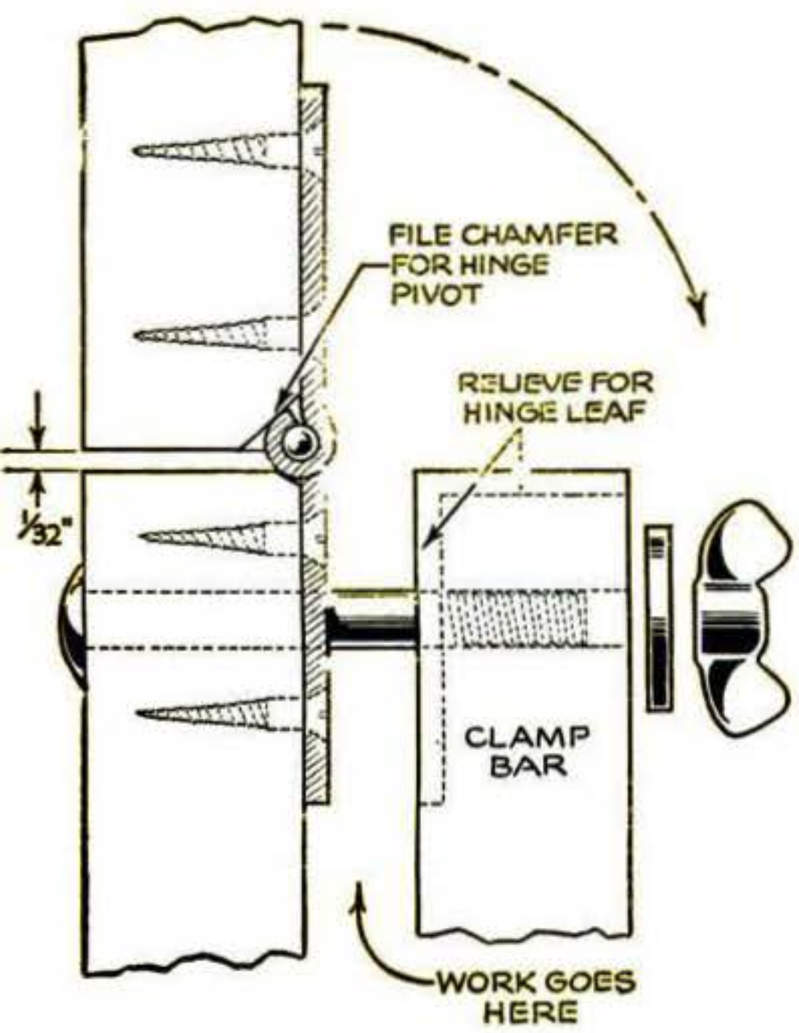
Mending rips. These usually start as superficial breaks in the body of the carpet and—at that stage—can only be detected from the underside of the rug. With double carpet thread and a steel needle, make big, close whipstitches across the break. Then seal the stitches with a strip of gummed edging—the kind you apply with a hot iron. If the damage is only a small break that hasn't gone all the way through the rug, you don't need to stitch it. A piece of gummed edging will do the job. END

3 **Then fold the binding** around the edge of the carpet and sew it to underside with stitches that don't go all the way through rug.



4 **Ready-made, doubleheaded** fringes are easy to attach. Slip edge of rug between heads of fringe and sew fringe on with matching thread.





Homemade Wooden Brake Forms Long Bends in Sheet Metal

It's usually hard to make clean, sharp bends in sheet metal longer than the width of your vise jaws. But with the simple bending brake shown here, you can form channels, simple moldings, and fluorescent-lamp reflectors of moderate length.

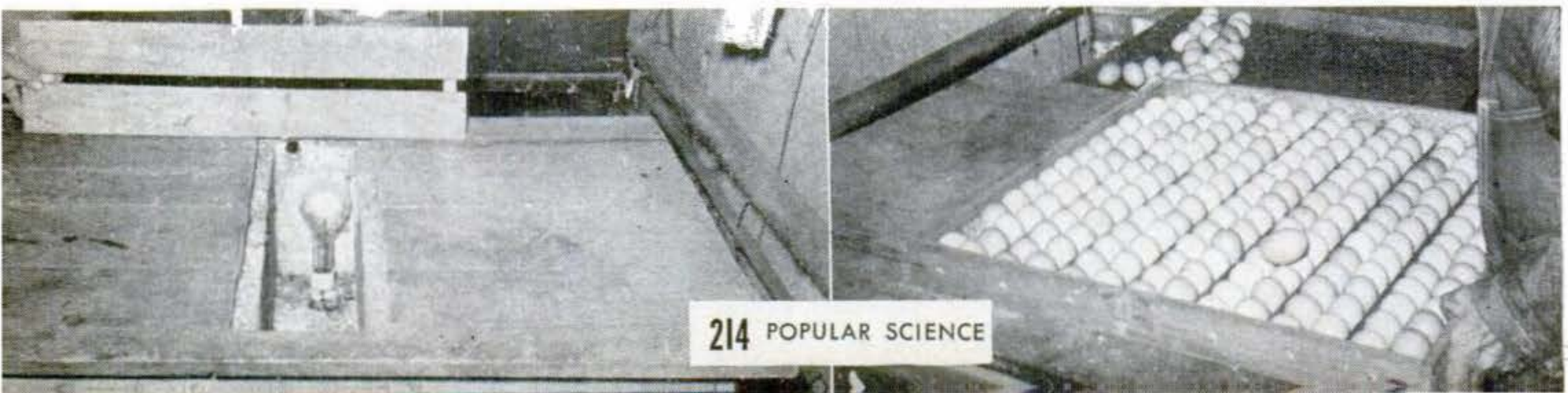
Use at least ⅞″ oak or maple for the two leaves. Surface-mount two sturdy strap hinges on them, centering the pivot pins as closely as possible on the lower arris of the movable (top) leaf. Cut a shallow step at both ends of the clamp bar, on the inside face and top edge, for the hinges. Drill ¼″ holes for carriage bolts to pinch the work between one leaf and the clamp bar.

Scribe the sheet metal where the bend is to be made and clamp it with this line along the top of the bar. Lock the brake in a vise as shown for extra rigidity. Then fold down the top leaf to the desired angle.—*Dick Hutchinson, El Monte, Calif.*

"Production-Line" Egg Candler Made from Table

To sort eggs faster, Charles L. Stratton, of Hollis, N. H., converted an ordinary wooden table into this production-line candler. He cut a 7″ by 26″ opening across the center of a 32″ by 42″ table and reinforced the table by nailing strips to the underside. Then he built a trough-like box and nailed it below the cutout. In the trough he mounted sockets for two 100-watt lamps. For the box cover, which comes flush with the table, he cleated together two wooden boards, leaving a ¾″ space between them through which the bright lights in the trough shine up.

To use the candler, Mr. Stratton racks his eggs in a square frame and slides the frame over the table. The light beam, shining through the narrow slit in the cover, strikes one row of eggs at a time. The light shows through infertile eggs, so they are easily distinguished from the dark-centered, fertile ones.



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Two small nozzles under back edge of hood direct water against windshield above the wipers.

How to Make a Windshield Washer

By Walter E. Burton

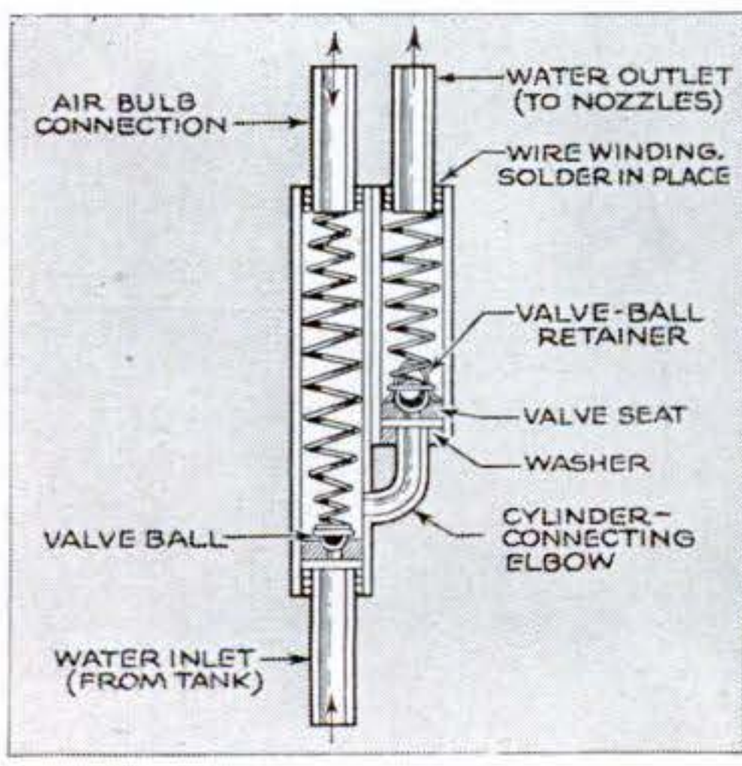
PRESSING a rubber bulb on this home-made windshield washer sprays enough water so the wipers can quickly clear your view. It's a real safety aid, especially for cleaning off that bug-and-dust smear that makes night seeing so difficult. Building it is mostly a soft-soldering job, and the cost should run no more than a dollar.

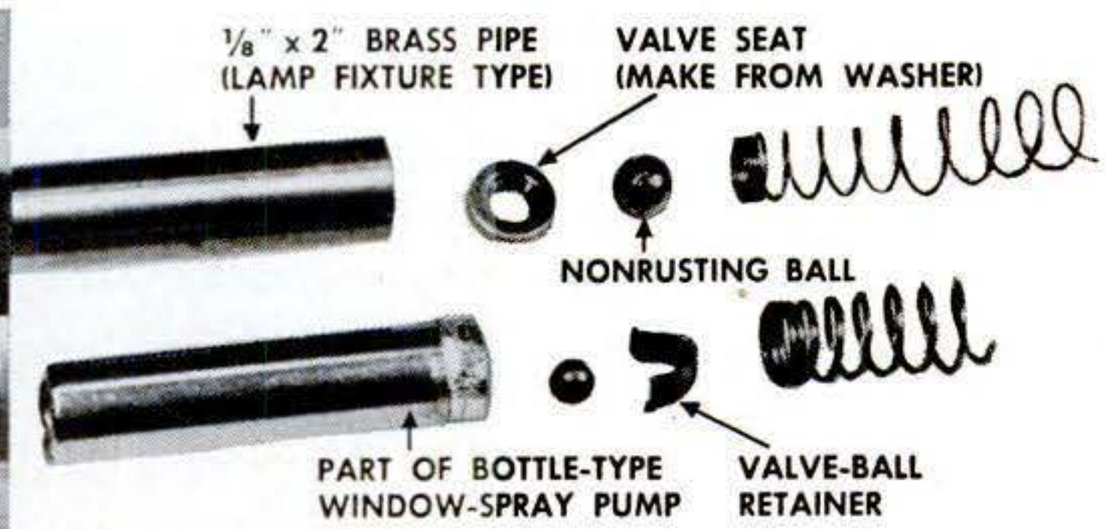
The valve unit. This consists of two metal tubes, each with a ball valve. To keep the job simple, buy a couple of the inexpensive finger-operated pumps used for spraying home windows. From each pump unsolder the short tube containing the valve assembly. These ready-made valves put you well on your way.

You can also start from scratch, using ⅛″ (⅜″ o.d.) brass pipe of the lamp-fixture type for the valve cylinders. Cut one piece 2″ long, another 1¼″.

Make the valve seats from brass washers at least ⅛″ thick. Enlarge the hole on one side with a countersink to give the ball a good seat. File or machine the outside diameter until the washer is a snug fit. Seal it in the pipe with solder. You can keep the valve balls captive by either of the methods shown in the drawing. Use only brass or stainless balls and springs.

Assembling the valves. Solder the two cylinders together side-by-side, staggering them to make space for the connecting elbow. Drill a hole in the longer (or lower) cylinder just above the valve. Bend the el-





Heart of washer is two check valves. In one valve, spring itself is formed into a cup to hold ball. In other, spring holds U-shaped retainer. Either system can be used for both valves.

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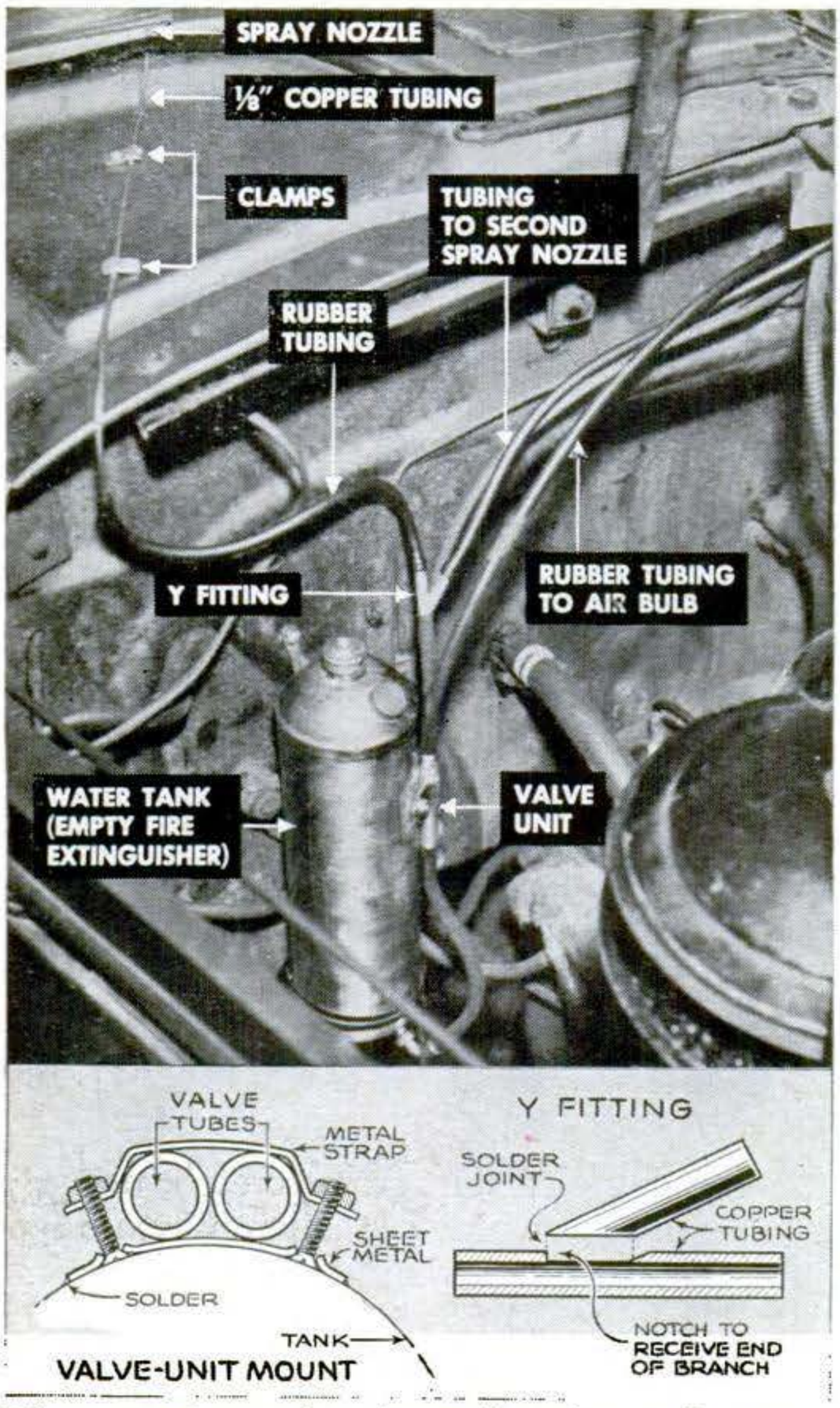


Water tank can be clamped to fire wall. Nozzle tubes pass under hood seal and are bent up and flattened at ends. Drawing shows Y fitting and how the valve unit is mounted on tank.

bow from small tubing and solder one end into the cylinder-wall hole. Solder the other into a washer snugly soldered into the bottom of the second cylinder.

After the springs and balls are in place, fit the three short (about 1″ long) pieces of tubing to the ends of the valve unit. Select these so the rubber tubing you plan to use will be a tight fit. To install the three short tubes, wrap bright copper wire around the ends, slip them into the cylinders, and secure with solder.

The tank. For my washer, I used an empty brass fire extinguisher of one-quart size, clamped to the fire wall. The valve unit is held against the tank by a sheet-metal strip and bolts that pass through another strip soldered to the tank. Water is delivered to the valves through a hose running from the bottom of the tank.

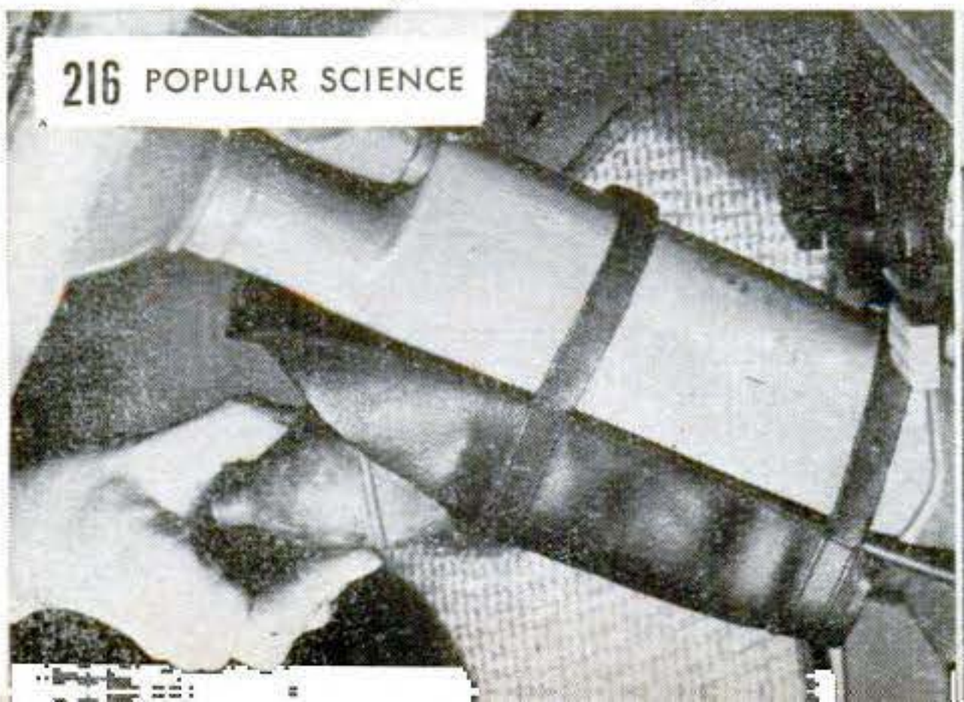
A good-sized glass jar could also serve as the tank, with the valve unit attached to the cap. Connect the water inlet to a small tube that runs through the cap almost to the jar bottom. Punch a small air hole in the cap.

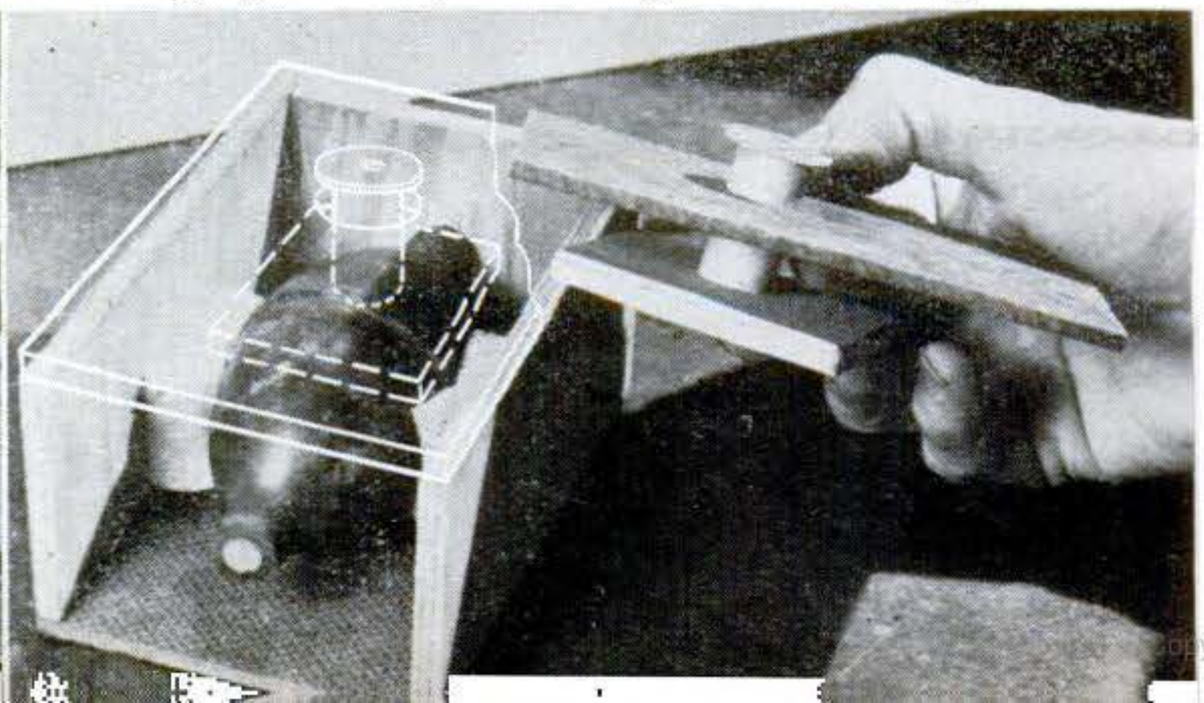
Connecting the tubing. All joints must be good and tight, so put a dab of gasket cement on the nipples before forcing on the connecting hoses. Besides the delivery hose between the tank and valve unit, you need a long piece of rubber tubing between the valve unit and bulb control in the driving compartment. Run this through any convenient hole in the fire wall. Make a Y fitting and install this to divide the water discharge line to the nozzles.

Installing nozzles. If it's a late model, your car may already have these. In that case simply connect the discharge tubes to them. If not, you can clamp two lengths of copper tubing, ⅛″ o.d. or smaller, to the hood shelf—and let the nozzles emerge in the joint between the hood and cowl. Flatten the outlets slightly.

The bulb control. A bulb designed for an atomizer can be used to operate the washer. If the bulb has a valve or hole opposite the tubing connection, plug it so air can't enter here. Mount it either where you can squeeze it directly, or where some button or treadle can do it for you. The tank can be filled with a mixture of plain water and window-cleaning fluid, but water alone does nicely. Don't forget to drain the system in freezing weather. END

Control bulb can be placed inside leather holster strapped to steering column, or inside a box fitted with a push-button squeezer. Such a box could be put on floor for foot operation. Once the system is primed, pressing the bulb sprays water; releasing it fills the system.





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Gus and the Miracle Jeep

[*Continued from page 164*]

then cruise parallel to the shoreline. The car that continued to function the longest would win the competition.

As the voice went on, Stan remembered that he had read how the motors of Army trucks and cars had been waterproofed for landings on beachheads by coating their ignition systems with putty, goo, and a waterproof varnish. He also guessed now what Gus and Ted Stevens had been doing behind the "iron curtain." And he was sure of it when he recognized Ted Stevens as the driver of the second jeep from the left.

At a signal from the officer in charge, all five cars began to move toward the water's edge. With their three stacks extending above their bodies, they looked like so many waddling beetles. They all entered the water at about the same time.

The squad car stalled before the water had reached half way up its hood. It sputtered a few times and died. One of the jeeps stalled a minute or so after it got fully submerged. Within the first five minutes three of the cars were out of the race and their drivers were wading ashore. The remaining two cars—a jeep and the carryall—were now putt-putting up and down the shoreline. Then, finally, after about 15 minutes, the carryall conked out, and the winning driver piloted his jeep toward the shore. Even before the car was out of the water, Gus was on his feet.

"Let's get down on the beach," he yelled. "That's Ted's jeep."

Ignition Off, but Engine Runs

By the time Stan and Gus had clambered down the steep hill, Ted's jeep was up on the shore, still putt-putting away and surrounded by an amazed group of guardsmen and officers. The jeep's hood was up and they were peering down at a completely unwaterproofed ignition system. No goo, no varnish. The ignition switch on the dash wasn't even turned on, yet the engine was running fine.

When Gus shouldered into the group, Ted waved to him and gave him the now well-known first-finger-and-thumb circle that means success. Then to give added proof as to just how good his unit's unwaterproofed jeep was, Ted drove it out into the lake again, parked it under about four feet

[*Continued on page 222*]

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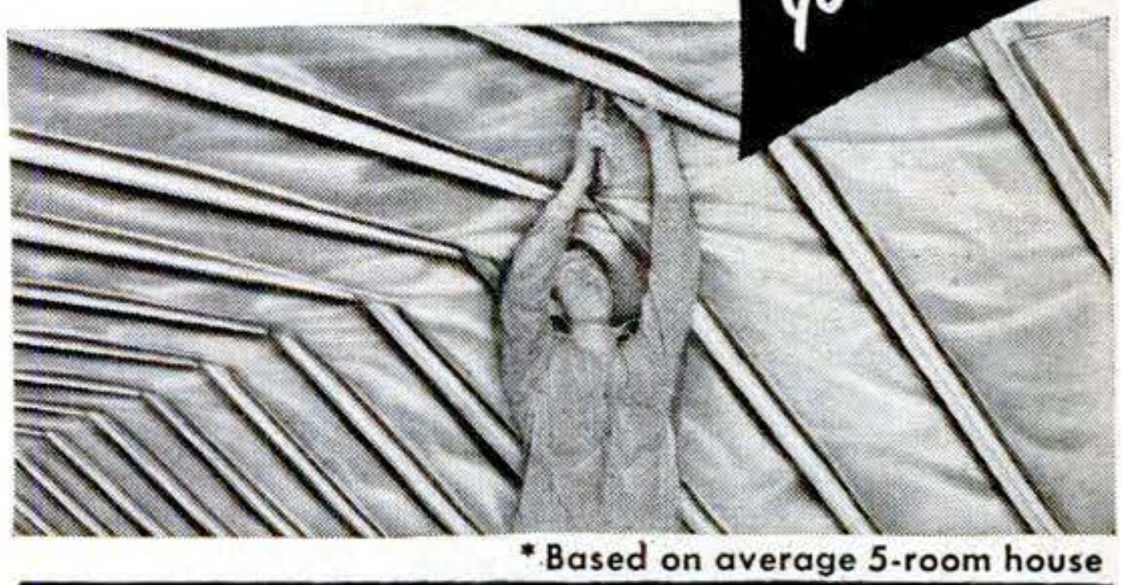

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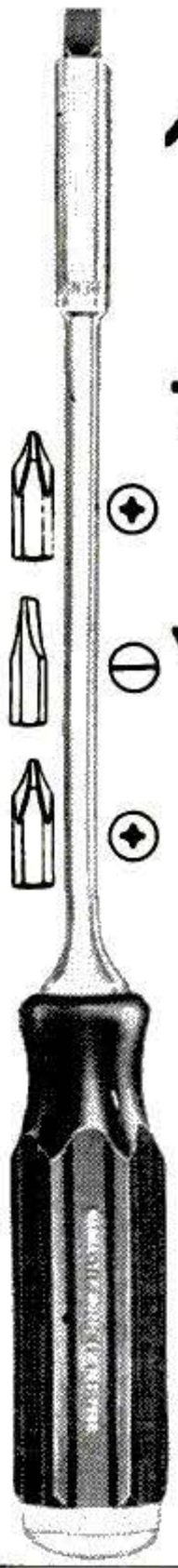

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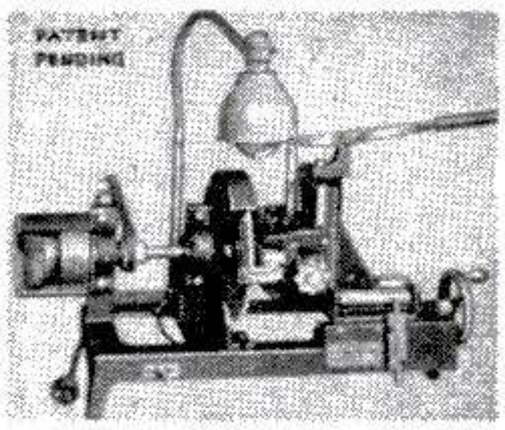

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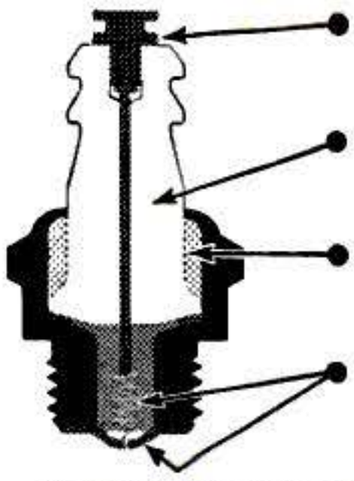

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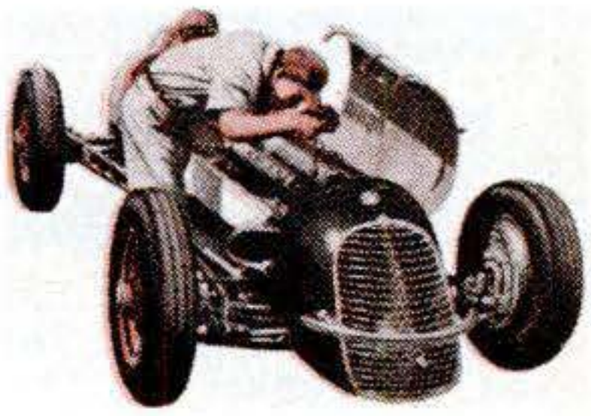

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Gus and the Miracle Jeep

[*Continued from page 218*]

of water, and swam ashore. The engine continued to run. After a few minutes he swam out again, and drove it back up on the shore to the cheers of the crowd.

"Okay, miracle man," Stan kidded after they'd got back to Gus's car and had started the drive back to the garage. "How did you master-mind that one?"

"I didn't master-mind it," Gus replied. "It was Ted's idea; I just helped out with the details and some of the work."

"Okay, okay," Stan said impatiently. "So what's the gimmick? Automobile ignition systems just don't work when they get wet. And besides, the ignition switch on that jeep wasn't even on. What did you do, stow away gremlins in the crankcase to push the pistons up and down?"

"Ever hear of a Diesel?" Gus asked.

"Of course I've heard of a Diesel, but what's that got to do with a gasoline engine in a jeep?"

The Curtain of Mystery Is Lifted

"It's just a matter of principle," teased Gus. Then, just before Stan really blew his top, he continued, "The whole thing goes back to Ted's war experiences, when he was attached to the motor corps of the 213th Medical Battalion of the 96th Infantry.

"During training, he was stationed at a camp near San Luis Obispo in California. With the rest of his gang he'd been taught the approved way of waterproofing cars for beach landings. Then one day two Corps vehicles showed up at the camp, a jeep and a carryall. They didn't have any waterproofing, so far as the ignition systems were concerned. Still they outperformed all the regular Division cars when it came to underwater operation.

"Ted's always been an inquisitive kid," Gus went on, "so he asked questions. The underwater trick, he learned, consisted of drilling one-eighth inch holes, one and one-sixteenth of an inch deep, into the centers of brand-new intake valves. With those holes in place, the engine, after it had been started and warmed up, no longer needs a conventional ignition system."

"I still don't get it," Stan said. "How in the heck can holes drilled in an engine's intake valves take the place of the hot sparks from spark plugs?"

[*Continued on page 224*]

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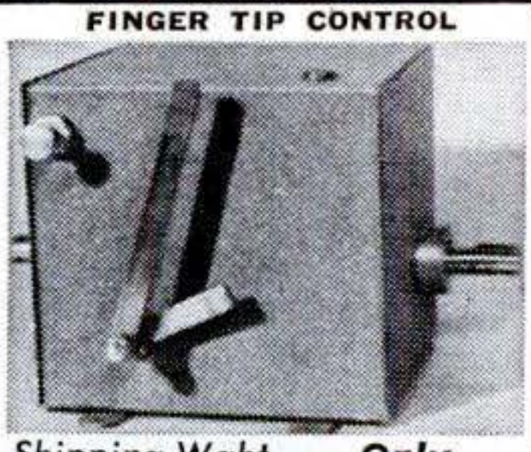

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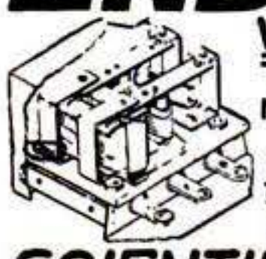

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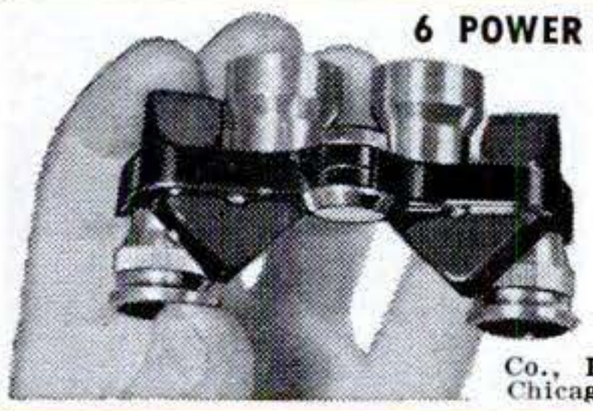

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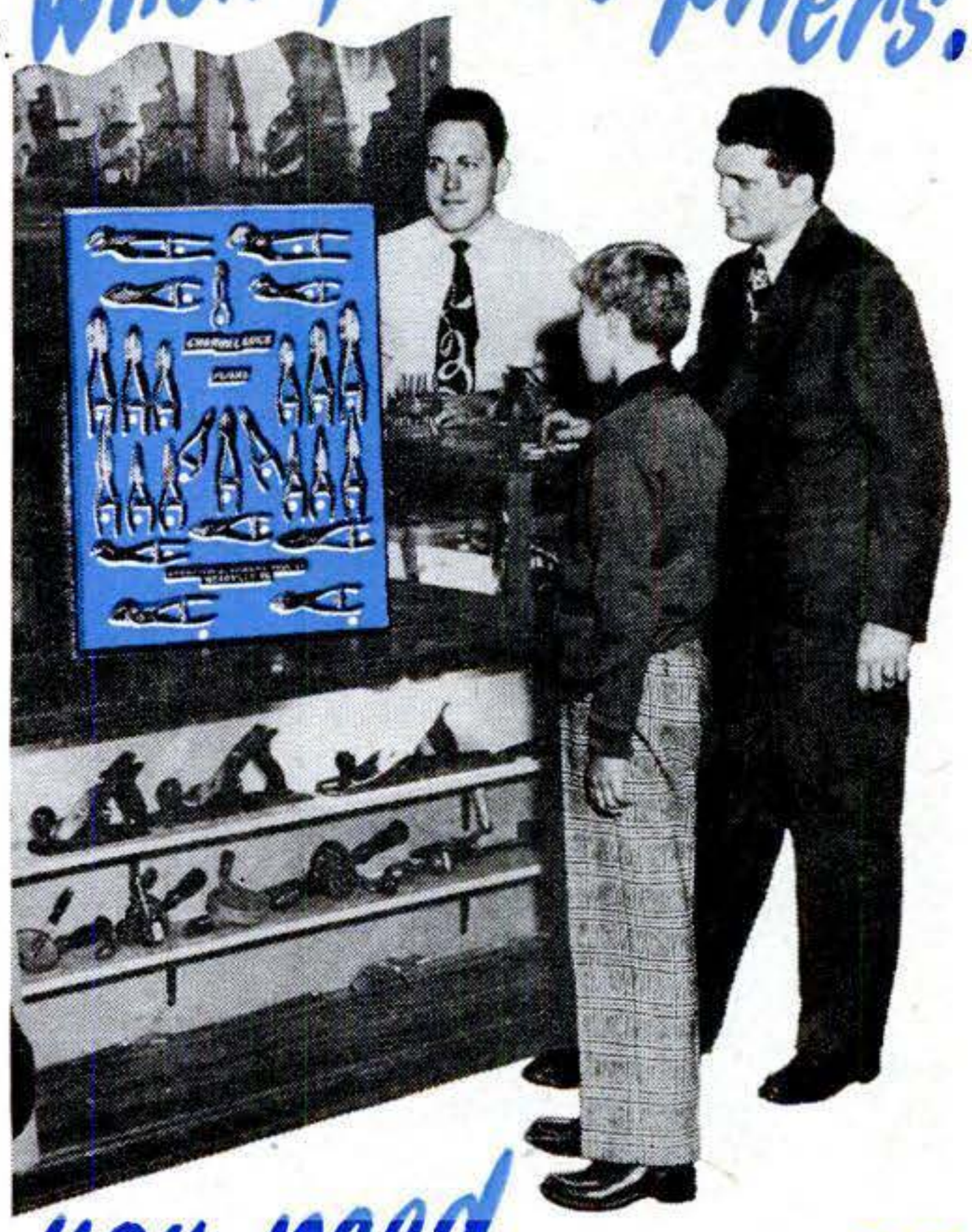

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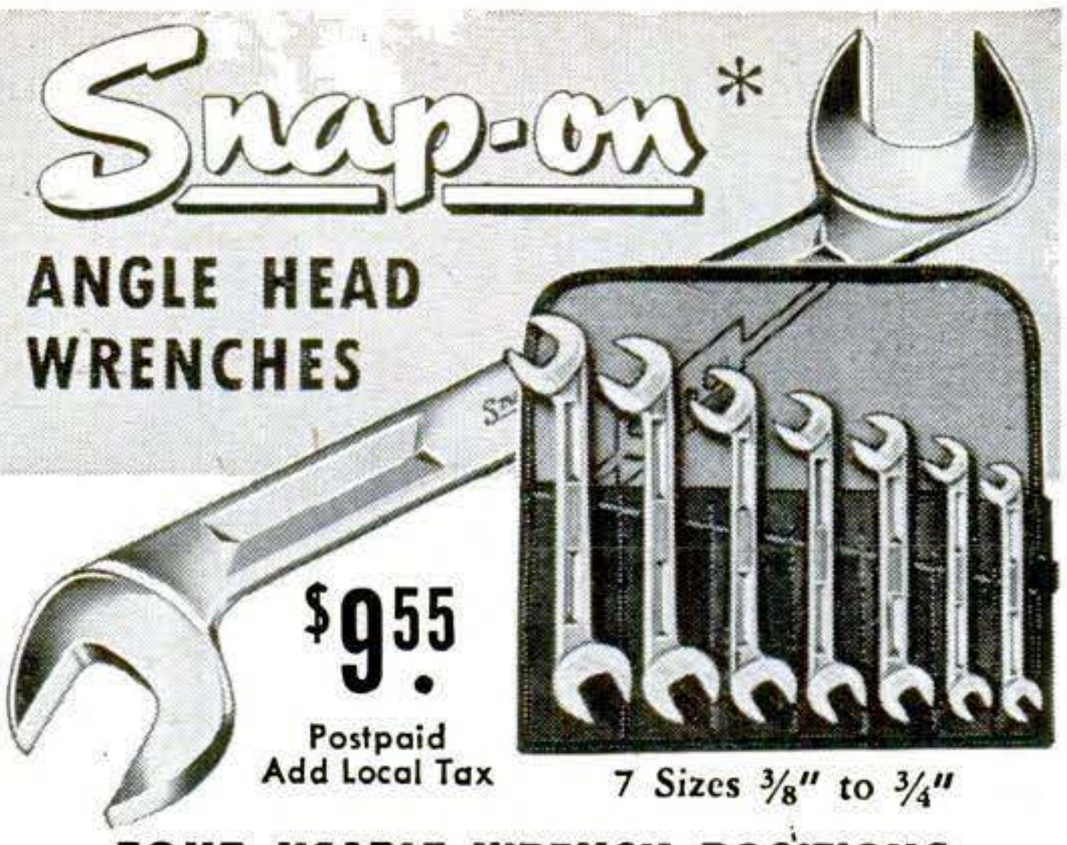

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IDEAL FOR USE IN CLOSE QUARTERS

Heads are set at 30° and 60° angles. Both openings are same size. By switching ends you can turn nuts in narrow swing areas where standard wrenches cannot operate. Hammer forged from finest alloy steel. Special Snap-on heat treating process toughens and hardens wrench from skin to core. Thin blade. Heavy chrome plated. Satisfaction guaranteed or your money back.

*Snap-on is the trade-mark of the Snap-on Tools Corp.

ORDER NOW!

SNAP-ON TOOLS CORPORATION
8060-H 28th Ave. Kenosha, Wisconsin

I enclose ( ) Check, ( ) Money Order for one set of angle head wrenches V-807K $9.55 postpaid.

NAME .....

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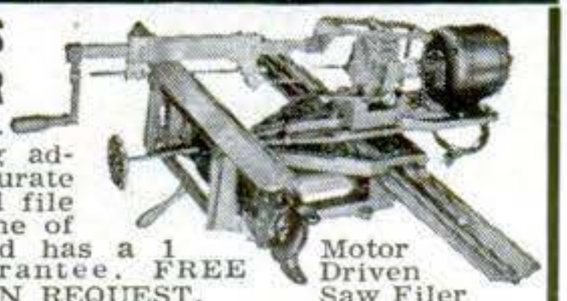
$ MAKE MORE MONEY FILING SAWS $

EARN $6 AN HOUR WITH THIS MOTOR DRIVEN BURR SAW FILER

It does a better, faster and easier filing job. No time killing adjustments necessary . . . the accurate operator-controlled file arm will file from both sides. Gives a lifetime of service and has a 1 year guarantee. FREE FOLDER ON REQUEST.


Motor Driven Saw Filer

SAW SHOP CHARGES Coast to Coast

WRITE FOR VALUABLE BOOK

Send 25c in coin for Burr's Blue Book of saw shop charges and other valuable information.

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BUILD YOUR OWN TILTING ARBOR SAW!

SAVE $50 OR MORE

- 27x28 in. table stays level. Blade tilts full 45 degrees.
- 10 in. blade cuts 3 1/4 in. deep, jack-screw depth adjustment.
- Floor model, 34 in. table height.
- New Departure ball bearing arbor, 3/4 in. precision shaft, ready to run, 5/8 in. bore blades.
- Quick-positioning, self-aligning rip fence guide.
- Sturdy wood, steel and aluminum construction.
- No machining—build easily with hand tools only.
- Capacity and performance of floor saws selling for $150.00 and up!!

GIL-BILT Step-by-Step pictorial plans (No blue-print reading required), full scale patterns, 11 actual photographs $1.00
GIL-BILT Metal Parts Kit includes Plans, ball-bearing arbor, cast aluminum miter gauge and bar, rip fence guide, machined lock knobs, jackscrew mechanism with 4 1/2 in. handwheel, and all other metal parts including every screw, bolt, nut and washer (less blade) $20.95
Same Kit with 10" combination blade 24.90
Same Kit with 8" combination blade 23.90

Return Kits in 10 days for refund if not satisfied.
(Prices include postage up to 600 miles)

Also available—Plans and Metal Parts Kits for 8" Tilt/Table Saw and 12" Band Saw. Order Plans at $1.00 each—sent postpaid anywhere in the world, or write for FREE descriptive Catalog.

GILLIOM POWER TOOLS P. O. Box 1-UH, Lambert Field St. Louis 21, Missouri

Gus and the Miracle Jeep

[Continued from page 222]

"That's what I meant about the Diesel," explained Gus. "The simplest Diesel engine—some people call them semi-Diesels—have hot spots in each cylinder to take the place of spark plugs. The hot spot, a knob or button of metal that retains its heat, keeps hot enough to fire the air-fuel mixture after each compression stroke.

"The same thing's true of the holes we drilled into the intake valves of the engine in Ted's jeep. After a little normal running with the jeep's regular ignition system, those holes got filled at the bottom with a deposit of carbon. Carbon retains heat, so, after a normal start with the regular ignition system, the 'carbon spark plugs' continued to do the firing, so it didn't matter if the ignition system got wet and conked out. As a matter of fact you saw Ted switch his ignition off once the engine had reached its normal operating temperature."

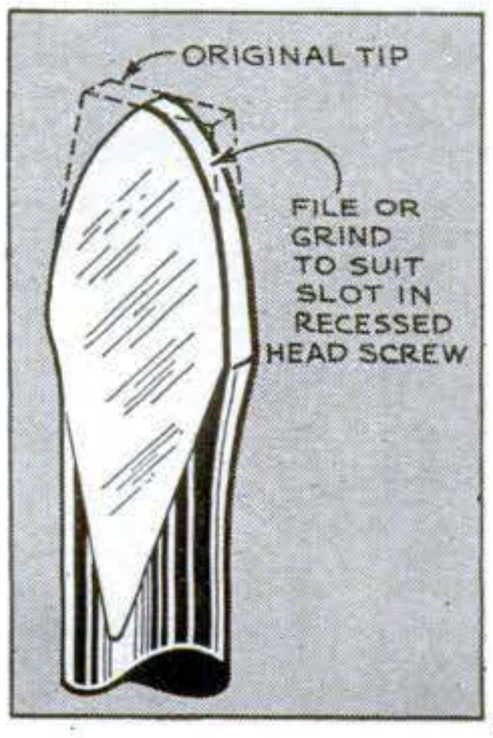
"Mind if I ask a couple of $64 questions?" put in Stan. "If that system works so well, how come the Army didn't adopt it instead of waterproofing? And why don't they just do away with the conventional electric ignition systems on all cars?"

"Well, in the first place," Gus explained, "it's not a particularly efficient ignition system for general use and, besides, you have to have a conventional ignition system to run the engine until the carbon spots heat up. Then there's no way to control the firing of the cylinders, so the engine is always out of time. As a result, you lose power, have a rough-running engine, and waste gasoline.

"It was just a trick the Army tried and then abandoned," Gus added. "But it was good enough to help Ted and our National Guard unit win this afternoon." END

Driver for Recessed Screws

If you get caught short for a screwdriver for screws with recessed heads, file or grind an ordinary screwdriver as shown in the sketch at the right. Afterward, you can dress the blade back to its normal shape. — *Arthur R. Christensen, Lockport, N. Y.*



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DREMEL'S STRAIGHT-LINE ACTION

GUARANTEES SCRATCH-FREE SURFACES

Here's fast cutting, finish sanding at its best. Dremel introduces a new electric sander, sturdily built to withstand hours of continuous use. It is light in weight . . . will not tire operator. Its **straight-line (non-rotary) action** leaves no scratches, no rotary marks—just satin-smooth surfaces ready for any type finish. Here, for the first time, is an electric sander built for years of faithful service—all at the remarkably low price of **only $24.50.**

New DREMEL Electric MODEL 2000 SANDER • POLISHER

ONLY $24.50 WITH STEEL CARRYING CASE AND COMPLETE ACCESSORIES

14,400 Sanding Strokes Per Minute

(PATENTED)

A POWERFUL, FAST CUTTING TOOL FOR CRAFTSMEN, HOME and INDUSTRIAL USERS

Craftsmen find this new Dremel model has the extra stroke and power needed for heavier woodworking projects such as cabinet-making, boat building and refinishing, garden furniture, etc. Home-owners say it's just the tool for preparing surfaces for painting and varnishing—for refinishing walls, woodwork, furniture, dry wall joints, siding and other surfaces. The Model 2000 also does a professional job of polishing waxed surfaces—eliminating all the back-breaking labor on cars, furniture, floors, stairways, etc. Industrial users likewise find this new Dremel Sander a faithful performer in furniture, cabinet, building and body shop operations.

RUGGED DESIGN and PERFORMANCE FEATURES

- Only two moving parts—requires no oiling.
- Reciprocal (straight-line—non-rotary) action leaves no marks...cannot burn surface.
- 21 square in. sanding surface speeds production . . . 14,400 cutting strokes per min.
- Cam-type holder permits changing paper in seconds.
- Die-cast aluminum housing with moulded Bakelite cover . . . Light weight, only 5 pounds . . . Over-all size 3⅛" wide, 4½" high, 7" long.
- 8 ft. Underwriter's Approved cord...uses 110-120 v. A.C.

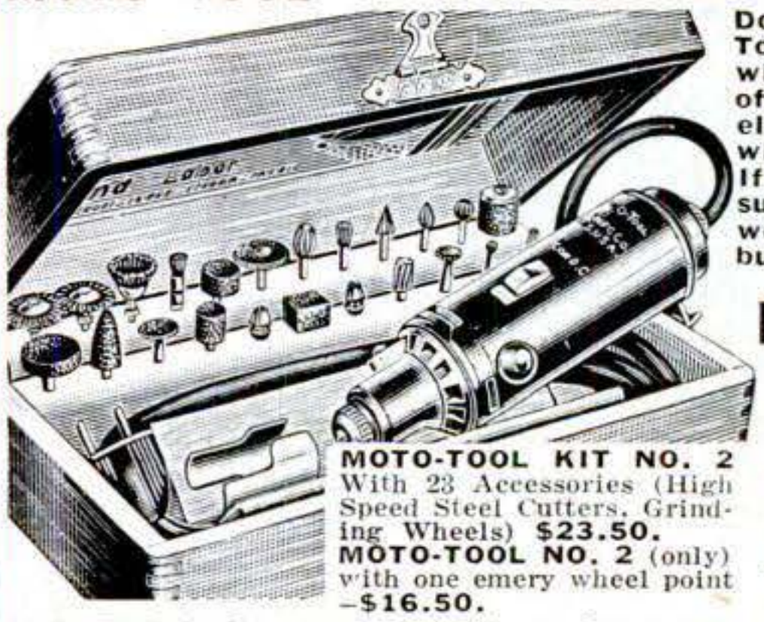
PRICE INCLUDES STURDY CARRYING CASE

Perfect portability of Sander, cord, abrasives, and polishing pads is provided in this sturdy, 3-shelf metal storage case. Price also includes 25 assorted sheets abrasive paper and a high-grade sheepskin polishing pad.

DREMEL Model "A" SANDER-POLISHER OVER 200,000 NOW IN USE!

A lighter-capacity Sander that takes all the work out of home or hobby projects. Popular with women for polishing furniture, etc. Same design and construction features as larger model. Furnished in attractive cardboard box. If your dealer can't supply, order direct from factory. $14.85

MOTO-TOOL—THE POCKET-SIZE MACHINE SHOP



Don't confuse Moto-Tools and Accessories with so-called "bargain offers." Compare Dremel feature for feature with competitive tools. If our products are not superior in every way, we don't want you to buy.

MOTO-TOOL KIT NO. 2 With 23 Accessories (High Speed Steel Cutters, Grinding Wheels) **$23.50. MOTO-TOOL NO. 2** (only) with one emery wheel point **—$16.50.**

Moto-Tool is the most versatile tool you can own—grinds, routs, drills, carves, engraves, polishes, etc. **Look at these features:** Approx. 27,000 R.P.M. • Dynamically balanced armature eliminates vibration. Oilless (oil-sealed) bearings • Dust-filtered air-cooling system • Weighs 13 oz. • Uses 110-120 v. AC • Used in plants of General Electric, Ford, Remington Arms, Nash-Kelvinator, etc.

Portable DRILL PRESS

Only $9.95 (Less Moto-Tool)

DREMEL Electric COPING SAW

CUTS SCROLLS LIKE MAGIC—SANDS AS IT SAWS

BLADE FACES 4 WAYS

JUST GUIDE IT!

Only $5.85 with 3 saw blades

FREE PROJECT PLANS

. . . for 6 useful projects packed with each saw

SAFE! AS A HANDSAW

For home, hobby, repair work—no other tool pleases so much for so little cost. Works in any direction—delivers 7,200 strokes per minute smoothly, effortlessly. Saws through ¾" medium-hard wood at a foot-a-minute speed. Touch-of-the-trigger, foolproof action. Only 2 moving parts, never needs oiling. Uses 110-120 v. A.C.

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ELECTRIC DREMEL POWER TOOLS

Dremel Tools are sold everywhere. If your dealer cannot supply you, send remittance in full and we will ship postpaid. Or send only $2, and pay postman balance plus postage and fee. **Money back if not delighted after 5 days' trial.**

DREMEL MFG. CO., Dept. 120-H, RACINE, WIS.

WELD BRAZE, SOLDER, and CUT →

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EASILY... QUICKLY!

No experience needed. Follow simple instructions, weld on iron, steel, bronze, brass, aluminum, and other metals. Plugs into any properly wired 110 volt A.C. or D.C. line. Make or save time and money doing repair work for yourself and others. Repair men, farmers, tinsmiths, home and auto owners, hobbyists, etc., say FOUR-WAY pays for itself over and over. Order today or send for Free details.

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PERMANENTLY mends cracks or holes in wood, tile, stone or plaster. Sticks and stays put—Does not chip, shrink or fall out. Easy to use. Economical. Mold it, chisel it, polish or paint it. If unobtainable from your lumber, paint or hardware dealer, the big 4-lb. can will be sent you postpaid (in U.S.) for only $1. Full money-back guarantee, order now.

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Fits all ceilings. Just saw the hole in your ceiling—frame the hole with 2x6's, nail the stairway in place and cut off the stairway at the calibrated ceiling height. The Precision Stairway is simple and easy to operate. No springs, actuated by counterweights, it's perfectly balanced, raising or lowering easily with one hand. Composition safety treads on steps. Insulated door panel. Requires no attic space. Made of No. 1 kiln dried popular with cast brass hinges, heavy cast aluminum rocker arms and brackets. Approved by F.H.A. everywhere

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SAFE JIG SAW **SYNCRO ELECTRIC**

READY—basic tool for Dad's workshop yet so safe small children may use! Cuts ANY length ½" wood, thin metal, plastic. Stroke easily adjustable. No oiling, gears, belts. With BUILT-IN MOTOR, 3 blades, cord, plug $17.50 at dealers or postpaid from SYNCRO Corp., Dept. G-80, Oxford, Michigan.

REMEMBER IT'S DANGEROUS to pay less if you want safe balanced matched tires. Hundreds of thousands of folks in U. S. have sent their money in advance, assured by satisfied friends, that we will never break faith.

GOODYEAR Firestone

GOODRICH, UNITED STATES, GENERAL, FISK, KELLY & OTHERS

Our policy is to select your tires so carefully, as if our very future depended on the service given by that particular tire.

FREE TUBE WITH EVERY TIRE	ORIGINAL GOOD TREAD JUST SLIGHTLY WORN	NO RECAPS NO RETREADS

*****GRADE. 16 MONTHS GOLDEN RULE GUARANTEE BOND

600-16	$4.19	700-15	$4.50	650-20	$7.90	32x6 (8)	$8.60
650-16	4.65	670-15	4.75	700-20	8.50	32x6 (10)	10.75
700-16	5.20	710-15	5.20	750-20	8.60	900-20	13.40
650-15	4.40	550-17	4.65	825-20	14.25	1000-20	14.20

DELUXE GRADE. 26 MONTHS GOLDEN RULE GUARANTEE BOND
THIS GRADE MADE THE BLATT NAME "WORLD FAMOUS."

TAKE $2 off the price of each deluxe grade tire. If you do not wish the tube.

				MATCHED BALANCED TRUCK TIRES			
600-16	$7.35	650-15	$7.75				
600-16 (6)	7.95	670-15	7.75	600-20	$10.95	900-20	$16.75
650-16	7.95	700-15	7.95	650-20	11.25	1000-20	17.50
700-16	7.95	710-15	7.75	700-20	11.95	1100-20	18.50
750-16	8.75	760-15	8.35	32x6 (8)	12.50	1200-20	19.50
550-16	7.25	820-15	8.00	32x6 (10)	13.75	1000-22	16.75
550-17	7.75	475-19	7.45	750-20	13.50	1100-22	17.50
525-18	7.35	550-19	7.95	825-20	17.50	750-15	11.95

MILITARY★★★★★ Guar. 30 Mos. (Supers 14 Mos.) Rugged 45,000 Miles

600-16		150-16		900-16		750-20	
Super	$5.45	Super	$9.75	Super	$7.44	Super	$7.45
★★★★★	6.45	★★★★★	10.95	★★★★★	9.65	★★★★★	10.45
Rugged	7.45	Rugged	12.22	Rugged	10.75	Rugged	13.95

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Send check or money order and this ad for rush shipment. We won't ship a tire we wouldn't use ourselves. The name to trust in rubber.

Mechanics of Farming

By Ladd Haystead

■ Growing into the hottest farm story of the year is the rising use of NH_3 (anhydrous ammonia) as fertilizer. It will probably be applied to a total of somewhere around three million acres in about 12 states this year, as against none just four years ago. One problem has been how to plant the gas successfully four or more inches below the soil. Work on applicators, principally at Mississippi State College, has now resulted in models (see picture) with stainless steel fittings to avoid corrosion, more accurate metering, and evener distribution. The gas fertilizer contains 82 percent nitrogen as against around 30 percent for the dry types. Claims for it include cheaper fertilization, lower labor requirement, faster placement, and greater availability of plant food.

■ A three-wheel power mower that you can ride like a motor scooter while cutting the grass is announced by Belknap Mfg. Co., Bridgeport, Conn. Price: about $170.

■ University of California plant scientists have produced lemons two and three times larger than normal with a plant regulator known as 2,4,5-T (Monsanto Chemical Co., St. Louis). It also delayed yellowing on the tree and in storage, and prevented ripe lemons from dropping.

■ Individual 'greenhouses' for plants, made of plastic and called Raydomes, are offered by General Plastics Corp., Marion, Ind. The

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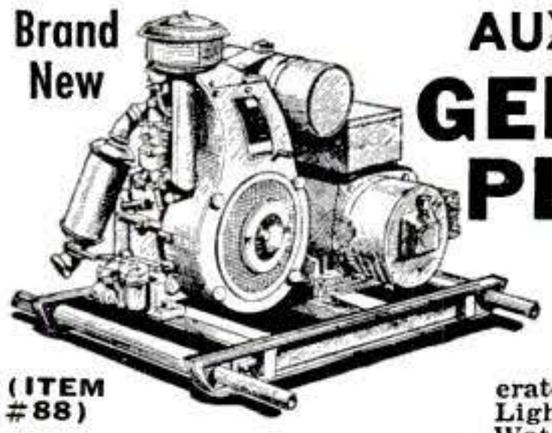
GROBAN'S BRAND NEW WAR SURPLUS SPECIALS! UNCONDITIONALLY GUARANTEED



Brand New

(ITEM #88)

AUXILIARY ELECTRIC GENERATING PLANT

For General Utility and Emergency Use

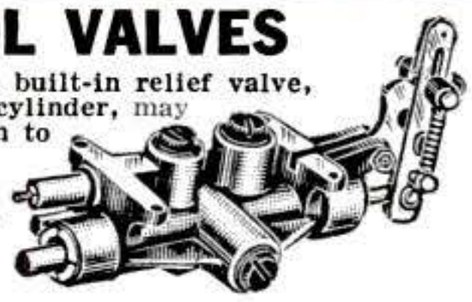
2500 watts • 115 volts
60 cycles A.C.

Plenty of current to operate your: Oil Burner, Sump Pump, Refrigerator, Home Freezer, Power Saw, Lights, Radio and Television, Home Water System Pumps.

Complete integrated heavy duty electric power plant, Signal Corps Model PE-75, driven by Briggs & Stratton, one cylinder 6½ H.P. Model ZZ, 4-cycle engine with killer button, oil bath air cleaner, governor, muffler, starting rope, and radio interference filter. The self-excited Leland or Westinghouse generator is rated 2500 Watts, 115 Volts, 60 cycle A.C. single phase, belt driven, with guard and duplex receptacle. When generator is not in use, you can use the engine separately to power other equipment. Mounted on adjustable steel skids, notched for carrying poles. Net. wt. 310 lbs. Shpg. wt. 440 lbs. Dimen. 36" x 19½" x 24". 12 month guarantee. $726.00 value. **NOW** ..... **295.00** F.O.B. Chgo.

Excellent Hydraulic VALUES!

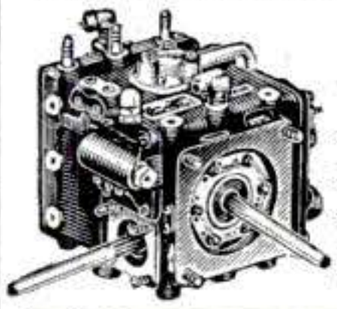
HYDRAULIC CONTROL VALVES



ITEM #24. Four-way control valve with built-in relief valve, for use with one double action hydraulic cylinder, may be used with 1500 P.S.I. hydraulic system to open and close hydraulic cylinders. Ship. wt. 8 lbs. A $38 value, **postpaid** **7.95**

ITEM #26. Four-way control valve for use with two hydraulic double-action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Ship. wt. 6 lbs. A $60 value, **postpaid** **10.95**

VICKERS HYDRAULIC TRANSMISSION



MODEL AA16801A Ideal for lathe drive, miniature cars, power machinery, gearing, etc. Rated 2 HP maximum input at 3750 R.P.M. Output speed continuously variable from 0 to ⅓ of input speed in either direction. Self contained reservoir. All controls external. Even power at all speeds. Complete with two ½" shafts with flat for pulley attachment. Shpg. wt. 20 lbs. Gov't. acquisition cost $325.00. A tremendous value at **25.00**
(ITEM #85) (F.O.B. Chgo.)

Hydraulic Cylinders-Air or Oil

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient, smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.

(Item #42)

ITEM #4—All steel double action hydraulic cylinder. 1⅛" bore, 2⅞" stroke. Clevis mounting. Will lift 1000 lbs. with 1000 P.S.I. line pressure. Perfect for positioning and feeding movements. Shpg. wt. 4 lbs. **F.O.B. Chicago** **4.95**

ITEM #33C—Double action hydraulic cylinder. 1½" bore, 4½" stroke. Clevis mountings at both ends. Uses ¼" pipe fittings ..... **Postpaid** **8.95**

ITEM #32—Double action, 1½" bore, 9" stroke, will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 4 lbs. A $45.00 value. **Postpaid** **10.95**

ITEM #41—Double action hydraulic cylinder, 2" bore, 6" stroke, clevis mounting at base and end of shaft. Overall length closed 12½". Has ¾" stainless steel shaft, uses ¼" tubing fittings. Will lift up to 3100 lbs. with 1000 P.S.I. line pressure. Weight 7 lbs. **Postpaid** **12.50**

ITEM #16—Double acting cylinder. 1½" bore, 27" stroke. (Will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 8 lbs. A $55.00 hydraulic cylinder value for only **Postpaid** **12.95**

ITEM #15—Double acting cylinder, 3" bore, 8½" stroke. All steel hydraulic cylinder, will lift up to 7000 lbs. with 1000 P.S.I. line pressure. Wt. 12 lbs. A $78.00 value, **Postpaid** **19.50**

ITEM #31—Double acting cylinder, 3½" bore, 11" stroke. Will lift 9600 lbs. with 1000 P.S.I. line pressure. Wt. 15 lbs. A $92.00 value ..... **Postpaid** **22.50**

Item #40—Double action, 3½" bore, 20" stroke. Rated lift capacity 9600 lbs. with 1000 P.S.I. line pressure. Clevis mounting, aluminum alloy barrel with 1½" stainless steel shaft and piston. Wt. 20 lbs. A $125.00 value. **F.O.B. Chicago** **25.00**

ITEM #42—Double action hydraulic cylinder. 4" bore, 18" stroke. Rated lift capacity with 1000 P.S.I. line pressure is 12,500 lbs. Ship wt. 30 lbs. **F.O.B. Chicago.** An Excellent Buy for **32.50**

HI-PRESSURE FITTINGS for cylinders and valves available at 35c ea. for ⅜" pipe and 50c ea. for ½" pipe.

G-I STAINLESS STEEL TANK

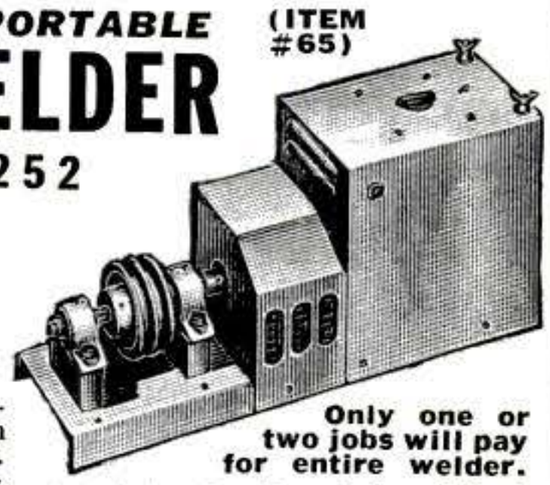
(ITEM #63)

Use these tanks on compressors, for tire inflators, pulsation chambers, floats, buoys, hydraulic reservoirs, fluid and milk containers, fuel containers, etc. Tough, light, shatterproof. 450 P.S.I. Aviator's Breathing Oxygen bottles, type G-1, 2100 cu. in. (approx. 9 gallons) int. vol. 24"x12", ¼" threaded openings at ea. end. Wt. 19 lbs. **(ITEM #63)** Price **F.O.B. Chicago** **4.95**

NEW! STATIONARY OR PORTABLE

D. C. ARC WELDER

(ITEM #65)



250 AMPS. MODEL 252

FOR ANY WELDING JOB, LIGHT OR HEAVY

Stop Costly Repair Bills, Weld It Yourself and Save

Only one or two jobs will pay for entire welder.

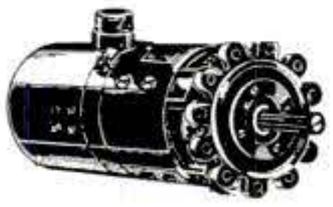
Designed for many years of trouble-free service. Handles anything from light gauge sheet metal to ½" plate. This precision-engineered Direct Current ELECTRIC ARC WELDER is offered at but a fraction of its original value. It can be mounted permanently or easily transported for portable use. Does the job instantly, where and when you need it.

The War Surplus generators for these Arc Welders were built by General Electric, Westinghouse, and Delco-Remy at a cost of over $300.00 They are light in weight; have oversized lifetime grease-sealed ball bearings; air-cooled commutator; dial type rheostat for easy pinpoint control; high-low range switch; reactor coil for even arc; handles 1/16" to ¼" rods. Run welder at 2500 R.P.M. from drive pulley or power take-off of tractor, a 7½" H.P. electric motor or a 10 H.P. gas engine. Use two V-belts, or flat belt (on pulley). Continuous welding rating—200 amps.; intermittent rating—250 amps.; 0-30 volts. Now . . . AT A FRACTION OF ITS VALUE. Price includes double V or flat belt pulley and instruction book. Ship wt. 107 lbs. **F.O.B. Chicago** **99.50**

ACCESSORY KIT including welding helmet, electrode holder, two 10 ft. cables with clamp and 5 lbs. of assorted welding rods. **(ITEM #66)** ..... **F.O.B. Chicago** **10.50**

Remember. Satisfaction is Guaranteed

DIRECT CURRENT GENERATORS



For welders, plating, truck and marine use, D.C. appliances, lights, etc. Aircraft quality—lifetime grease sealed ball bearings. Heavy duty.

Item #89—Type M-2, rated 50 Amps.—24 Volts. Mfd. by Leece-Neville Co. Shpg. wt. 32 lbs. Gov't. Acq. Cost $176.00. **F.O.B. Chicago** ..... **NOW ONLY** **16.50**

Item #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't Acq. Cost $300.00. Shpg. wt. 54 lbs. **F.O.B. Chicago** **22.50**

Item #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't Acq. Cost $380.00. Shpg. wt. 70 lbs. **F.O.B. Chicago** **35.00**

Each individually packed in wooden box.

EMERGENCY ELECTRICITY!

750 WATT • 115 VOLT • 60 CYCLE

A.C. LIGHT PLANT

(Item #86)

USE FOR: Home lighting, trailers, tourist cabins, hunting lodges, fire truck lighting, emergency standby units. Plenty of power for deep freezer, oil burners, incubator, radio or lights.

GENERATOR: Manufactured by Eicor, rated 750 Watts 115 Volts A.C., 60 cycles at 1800 R.P.M. Complete with volt meter regulator. $249.00 value. These generators, built to exacting Signal Corps specifications, are the answer to your lighting needs.

GASOLINE ENGINE: Briggs & Stratton, Model AP, 2¼ H.P., 1800 R.P.M. Completely radio shielded, full accessories including air cleaner, muffler, starting rope, killer button, remote control wire.

Shpg. wt. 165 lbs. Complete unit, $249.00 Value. NOW ONLY ..... **139.00** (F.O.B. Chicago)

GENERATOR ONLY **59.50**

Same as described above. Shpg. wt. 60 lbs. **(Item #67) F.O.B. Chicago**

UTILITY ROTARY VANE PUMP

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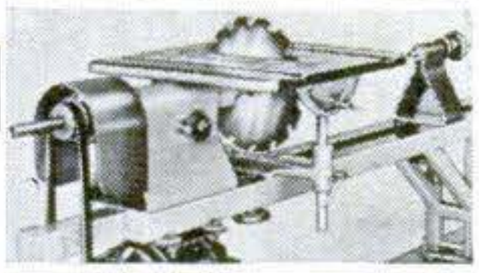

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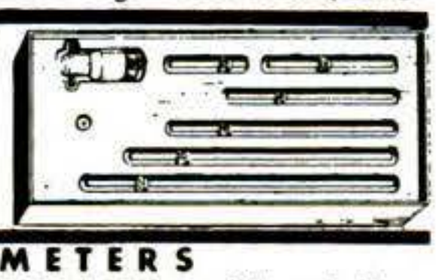

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Mechanics of Farming

caps are intended to prevent frost injury and help retain moisture.

■ The food industry--farms, factories, stores--is the largest in the country, according to a Twentieth Century Fund report.

■ Most farmers are demanding multi-purpose sprayers, says the Farm Equipment Institute. They want one machine to control insects, kill weeds, spray dairy barn and poultry house walls, and do painting. While such equipment was scarce just after the war, many new machines are being made now. Some of them eliminate several men; others are one-man jobs utilizing the mast principle and high pressures.

■ A new application of the vinylite-plastic coating that protects military equipment against weather and rust makes possible a large cut in the cost of sealing crop-storage structures for fumigation, says the Bakelite Division of Union Carbide and Carbon Corp. The material is applied with a spray gun and drys into a tough film that is resistant to weather, flame, and chemicals.

■ A cotton yarn wholly soluble in water, expected to be of value in the packaging of food products, is announced by the Southern Regional Research Laboratory, New Orleans.

■ Correction: The Scythette portable power mower described here in May (p. 242) is made by Hoffco, Inc., of Richmond, Ind.

■ Wanted: A device that can measure a few millionths of a volt. Hatcherymen need it to be able to tell whether or not an egg is fertile, says Karl Norris, engineer at Dept. of Agriculture's research center, Beltsville, Md. Such a gadget is expected to be available shortly.

■ While this column is devoted to the technical and non-livestock sides of agriculture, it is with nostalgia and some sadness we report the demise of the Horse Association of America. Founded 'to aid and encourage the breeding, raising and use of equine stock,' it has voted to dissolve after some 30 years of existence. Farm mechanics marches on!

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Get out of the Danger Zone

The More You Delay—The More You Pay

There's always danger ahead when piston rings wear out—danger of much greater expense unless new rings are installed promptly.

But if you *do* install new rings at the first symptom of wear, you can protect your engine and insure its long and economical life.

Check your own situation on the Danger Zone chart, with the help of your service man. This simple precaution may save you both money and headaches. For the more you delay the more you pay. And if you need new piston rings, get Hastings, the rings designed for replacement service. It's the best money you can spend on your car.

WARNING ZONE

Engine loses pep . . .

Needs a tune-up

Clean, adjust and re-time ignition. Clean fuel supply and carburetor screens. Adjust carburetor. Adjust tappets and fan belt. Check compression and vacuum readings for symptoms of ring wear.

DANGER ZONE 1

Engine begins to smoke . . .

Needs new piston rings and minor engine repairs

Replace piston rings. Align rods. Adjust rods or replace rod bearings. Reseat and reface valves.

Tune engine.

These repairs are comparatively inexpensive and put the engine back in peak condition for thousands of economical miles. Delay puts the engine in Danger Zone 2.

DANGER ZONE 2

Engine pumps oil badly . . .

Needs new piston rings and major engine repairs

Replace piston rings. Replace piston pins. Adjust—probably replace—main bearings. Align rods. Adjust rods or replace rod bearings. Reseat and reface valves. Tune engine.

These repairs naturally cost more than those needed in Danger Zone 1, but they put the engine back in condition for thousands of additional miles of satisfactory service. Delay leads to costly Danger Zone 3.

DANGER ZONE 3

Destructive wear sets in . . .

Needs new piston rings and complete overhaul

Repairs cost three or four times as much as in Danger Zone 1.

Remove engine. Rebore cylinders. Replace pistons, pins, rings. Replace main bearings. Align rods, refit or replace rods, or replace rod bearings. Overhaul valve lifters, rocker arms. Replace timing chains or gears. Reseat, reface valves. Replace guides and springs. Replace camshaft bearings. Clean oil lines. Overhaul oil pump.

Clean, re-install and tune engine.

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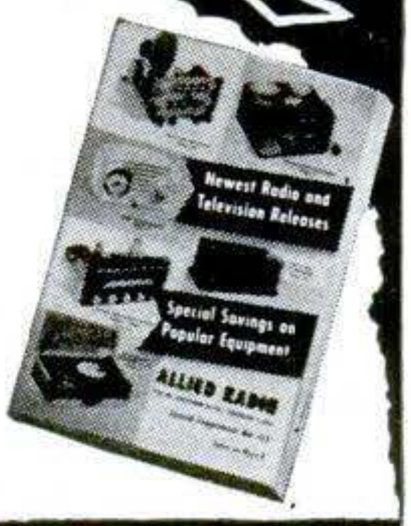

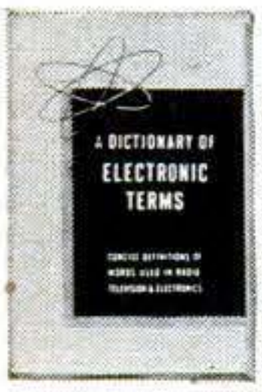

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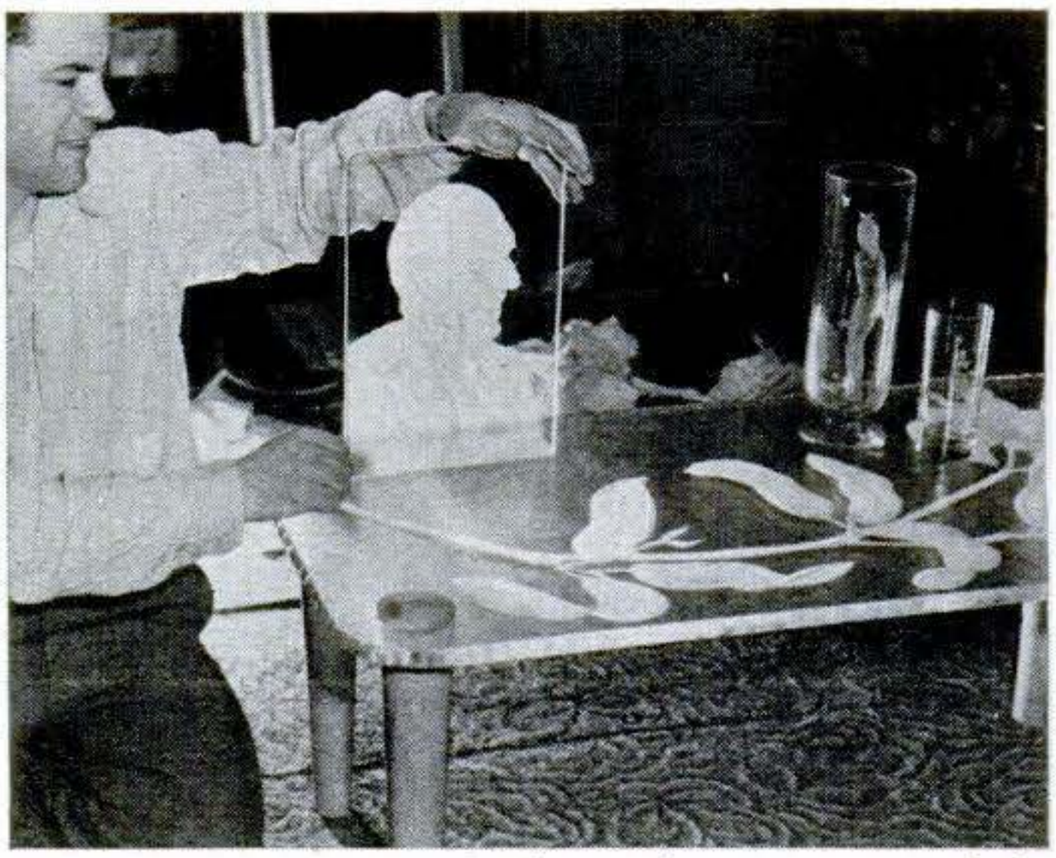

Willis G. Lowry with four glass items, including the portrait he is holding, all decorated by the sandblasting process. The table top, of rough plate, will sustain 600 pounds.

WHILE watching a sandblasting machine at work, artist and glass-designer Willis G. Lowry got an idea. If the force of the blast could be controlled, he would have an excellent tool for working with glass. He experimented with several models until he finally designed a machine that suited his purposes. Now, in his Silver Spring, Md., workshop, he is able to carve varying depths into glass, achieving three-dimensional bas-relief effects. His biggest job was making 47 glass murals for a county court house in Pennsylvania. Averaging three by five feet in size, they took him nine months to complete.

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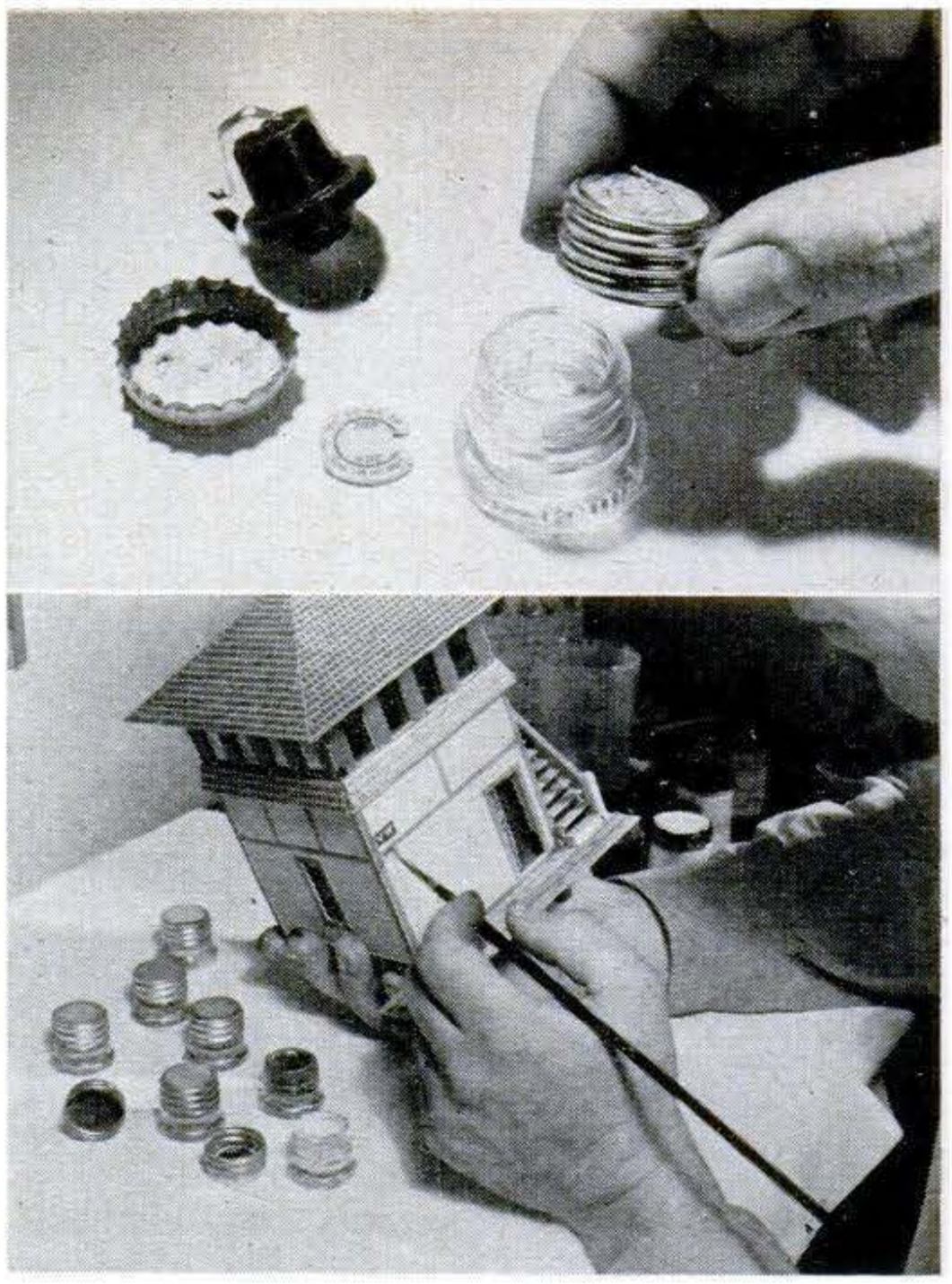

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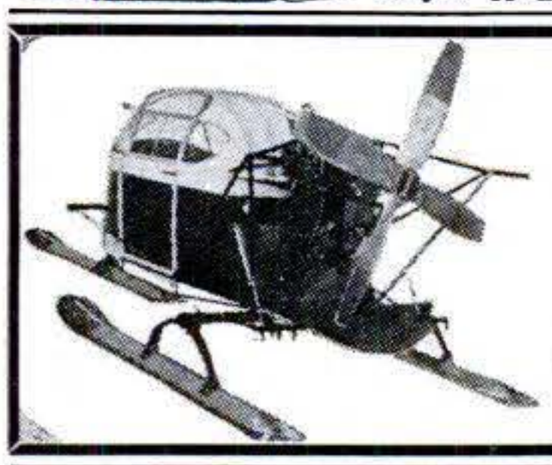

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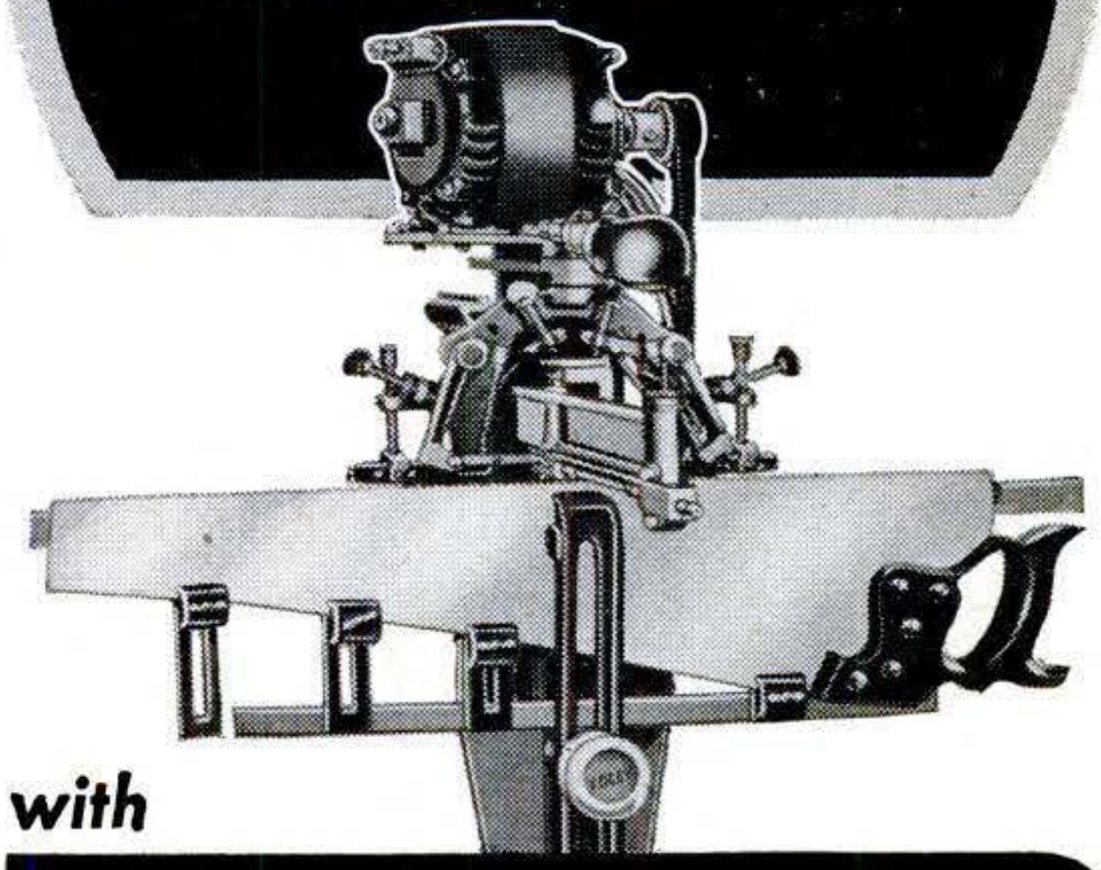

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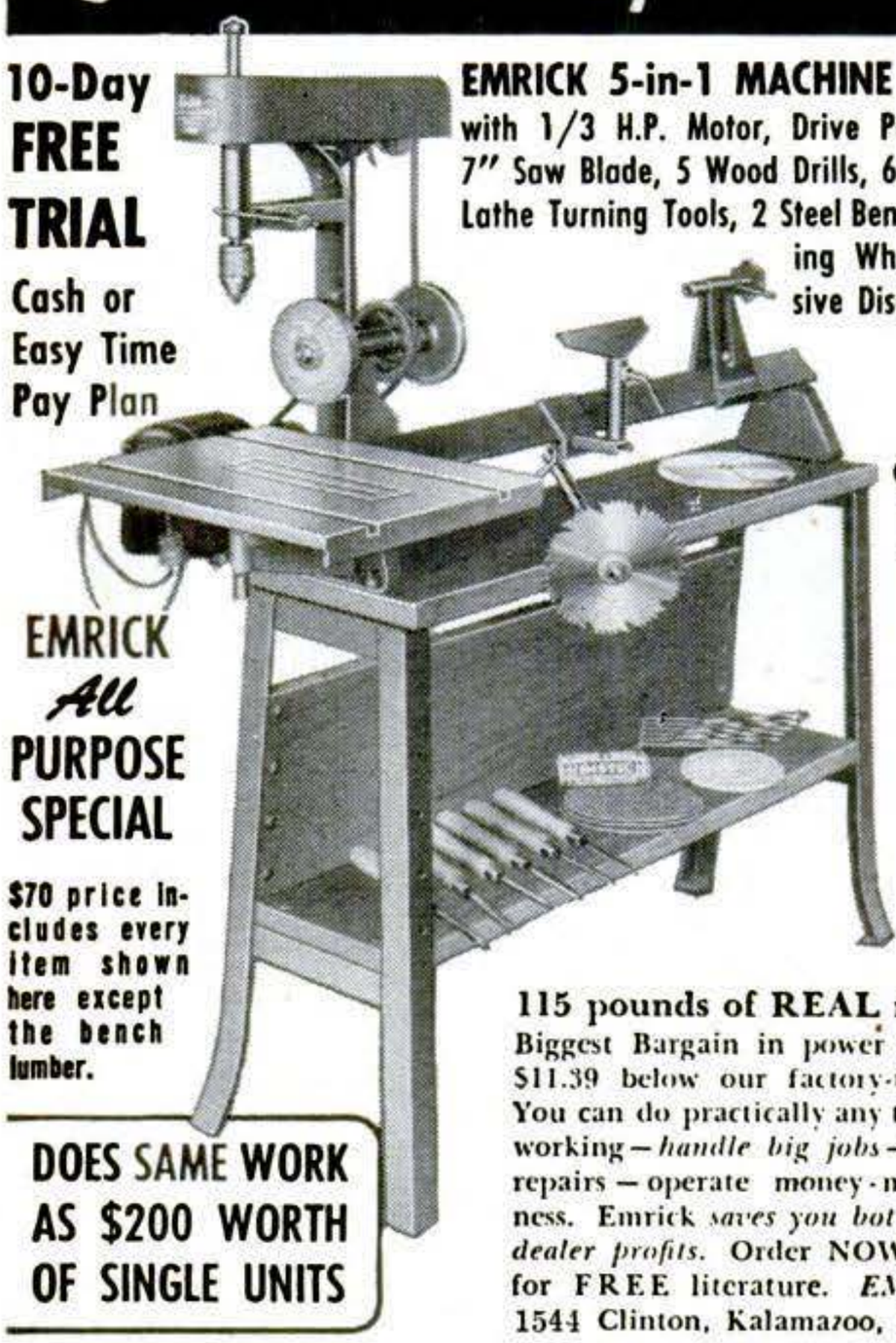

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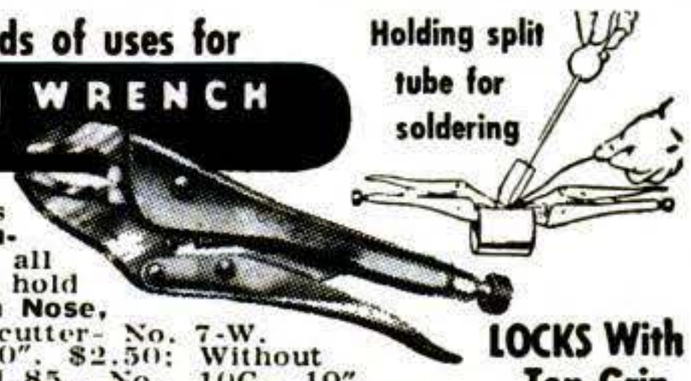
VISE-GRIP WRENCH



LOCKS to work with more than Ton-Grip! Does jobs no other tool can do. **Involute Jaw Curve** holds all shapes. **Knurled Jaw Tips** hold to the very tip. Has **Thin Nose, Super Wire-Cutter.** With cutter—No. 7-W, 7", $2.25, No. 10W, 10", $2.50; Without cutter—No. 7C, 7", $1.85, No. 10C, 10", $2.25. *If not at your dealers, order direct.*

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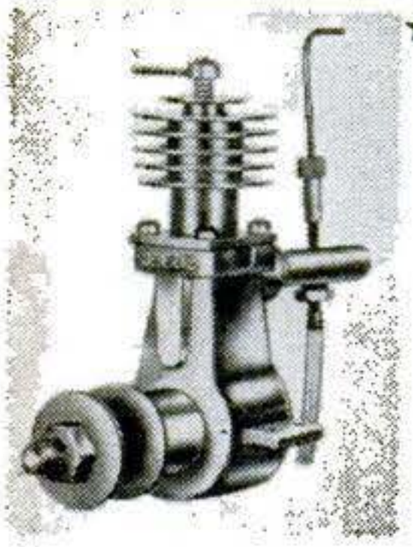

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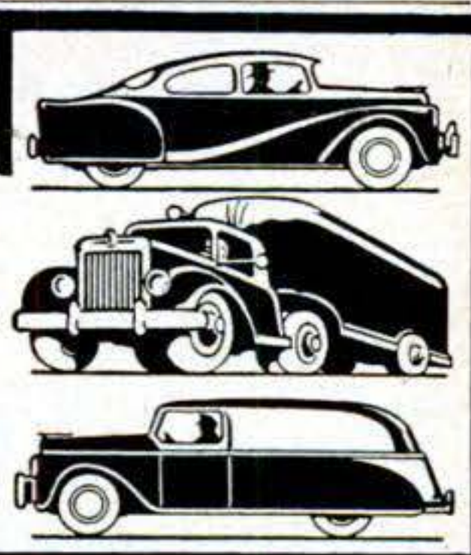

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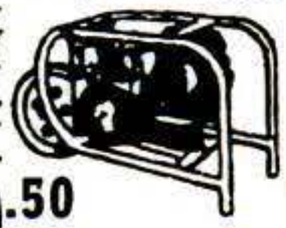

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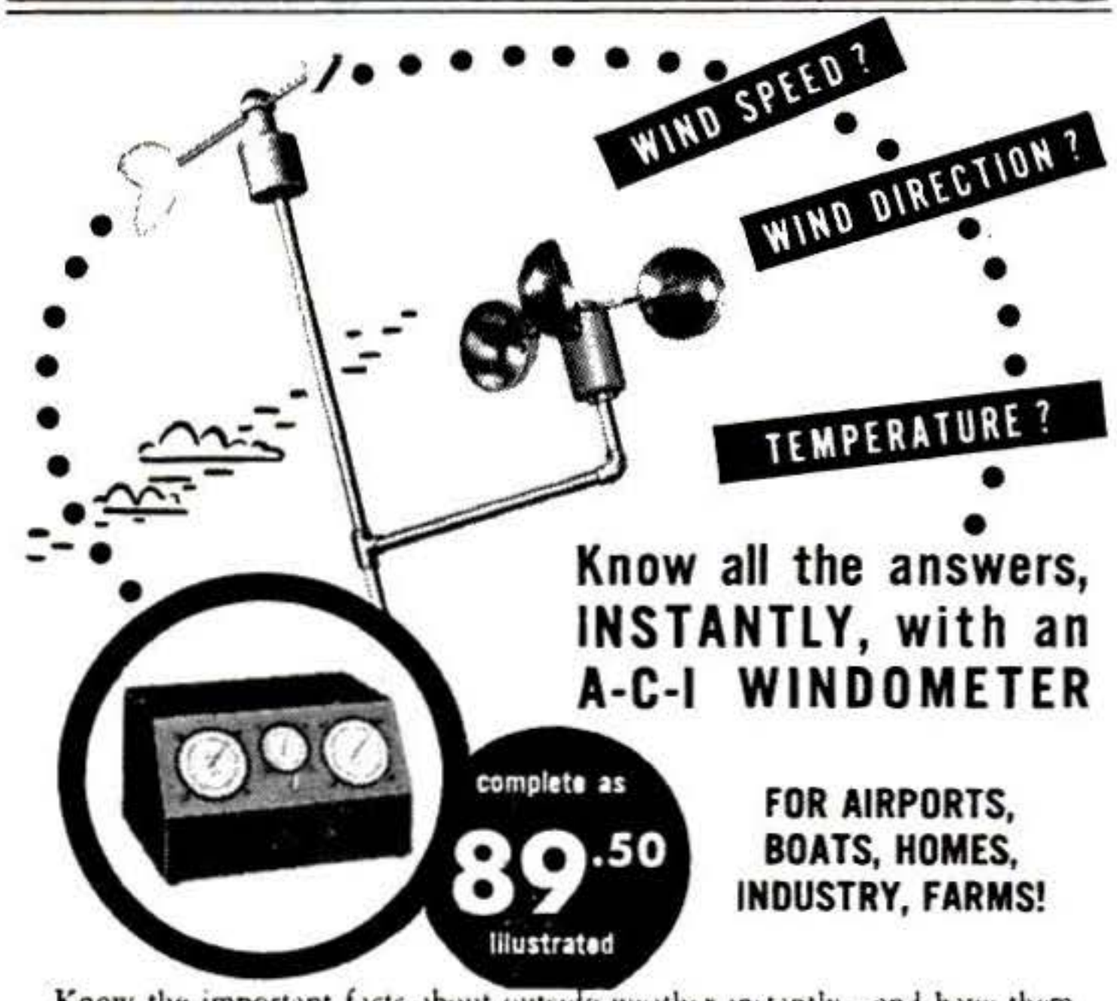

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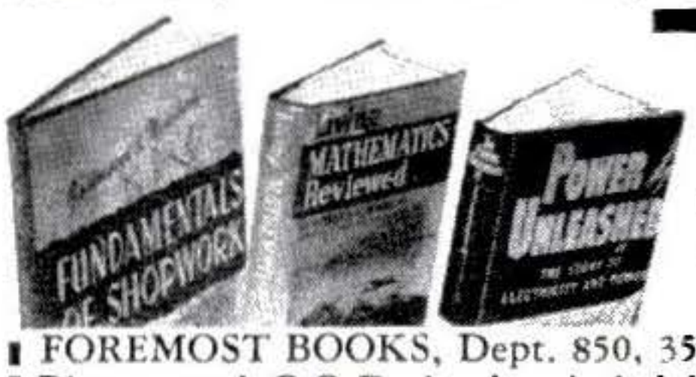

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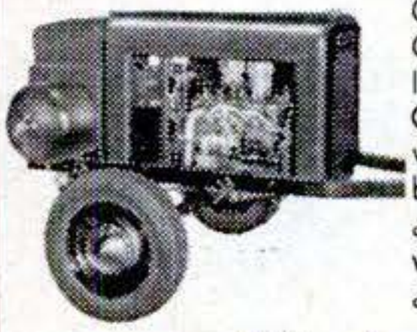

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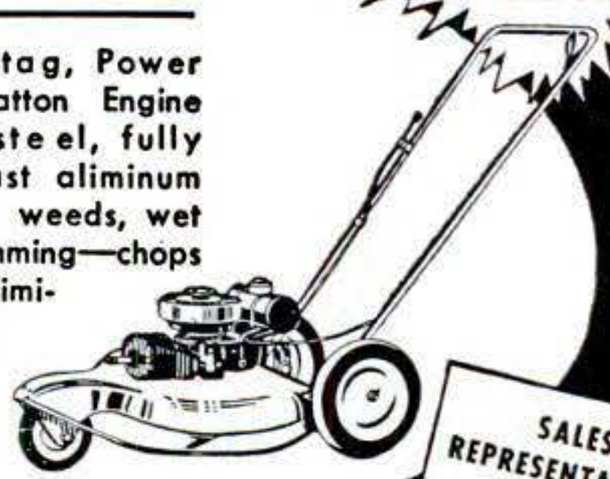

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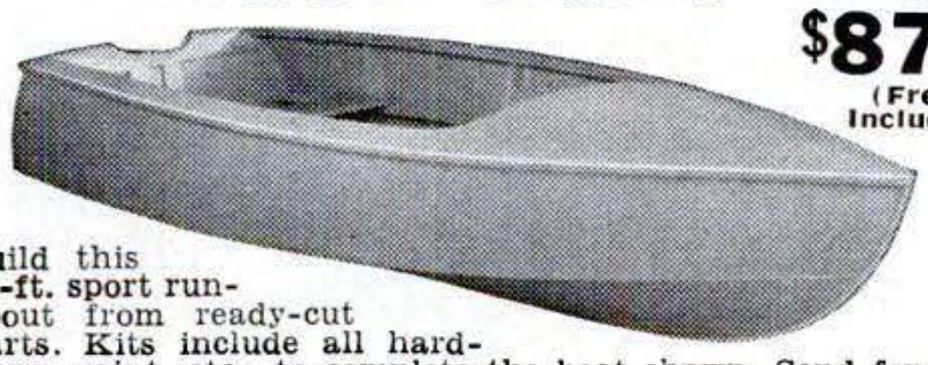

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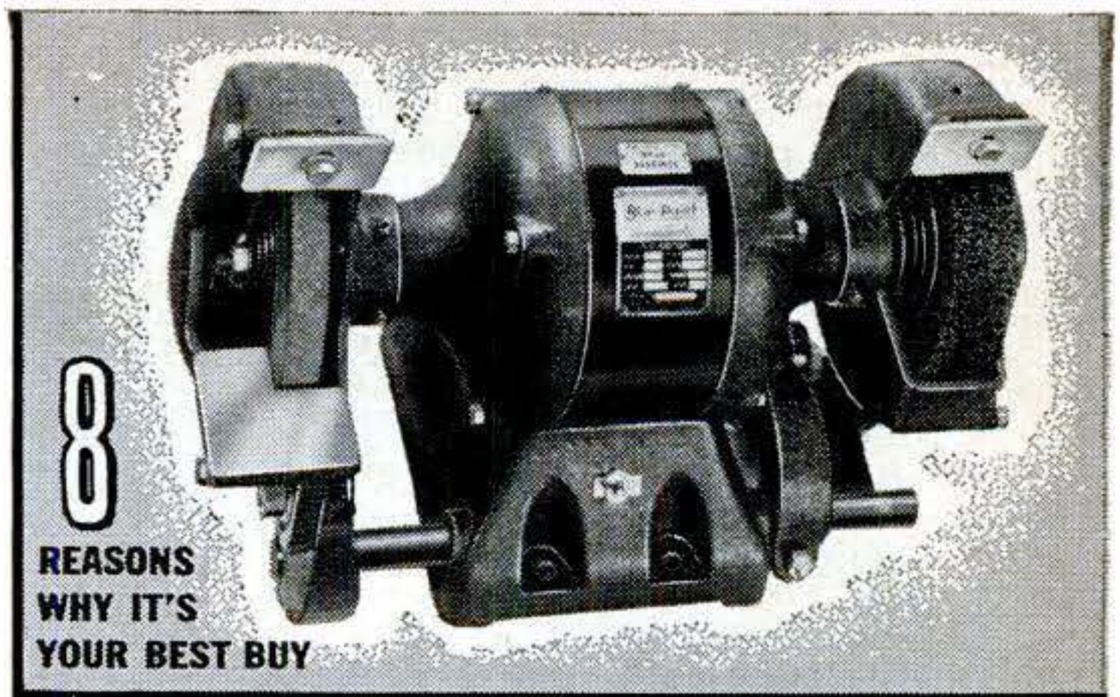

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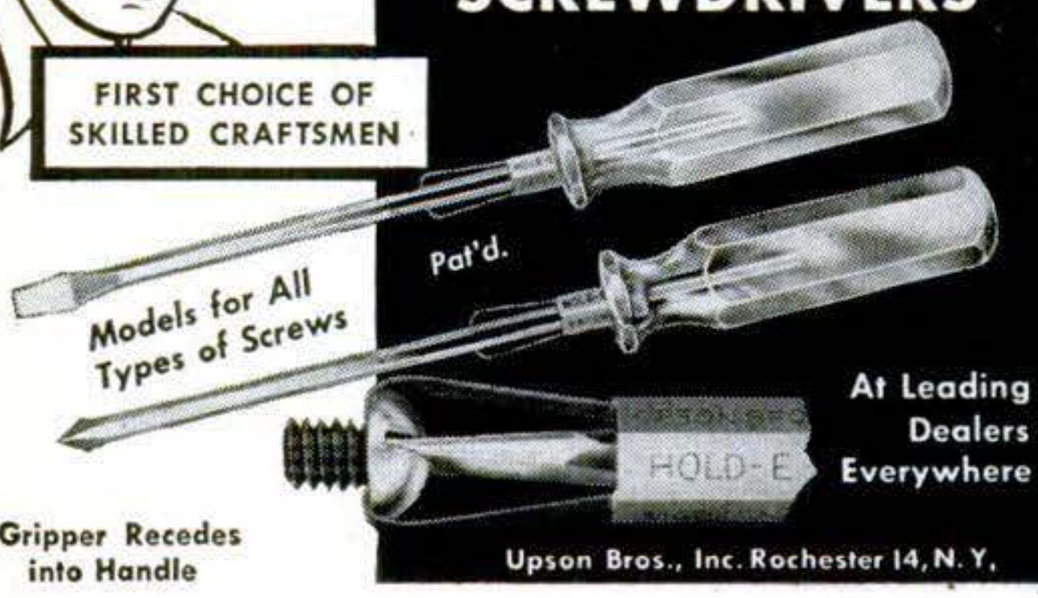

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The counter contains a double-lens eyepiece that is focused on a transparent screen. One side of the screen is coated with phosphor crystals, the other with a layer of tiny glass spheres. As alpha particles strike the phosphor they produce scintillations—tiny flashes of light—that are magnified first by the glass spheres and then by the lens. The flashes are bright enough to be seen under subdued white light.

The counter operates at a constant rate so it can be calibrated against a known sample. It sells for $5, complete with a red quenching filter and radioactive samples.

Grease Keeps Gaskets in Place

WHILE installing a gasket between two mating metal parts, apply wheel-bearing grease to one metal surface and press down the gasket. The grease will keep the gasket positioned while you complete the assembly. In addition, it helps the gasket form a better seal.—*K. Hadenfeldt, Storm Lake, Iowa.*

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WHEN fruit juices are spilled on the linoleum, always wipe them up promptly. These liquids are acid and may discolor the linoleum. Alkalies, such as a drain-cleaning compound, are also harmful and should get the same mop-up treatment.

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Model T-1 Brand New — 2 CYLINDER PISTON TYPE. Operates with ½ H.P. Motor or equivalent gas engine.

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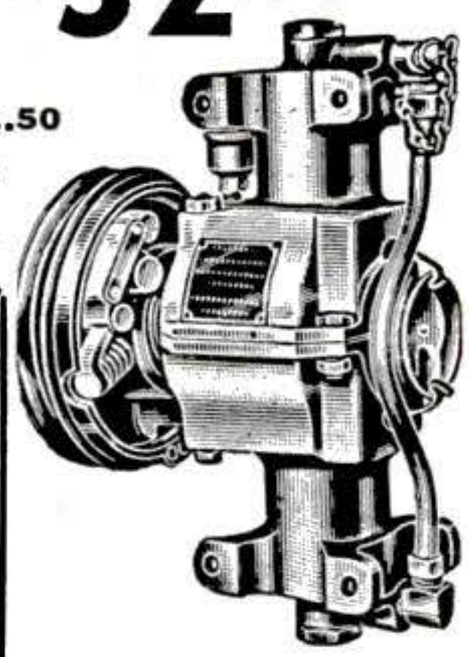

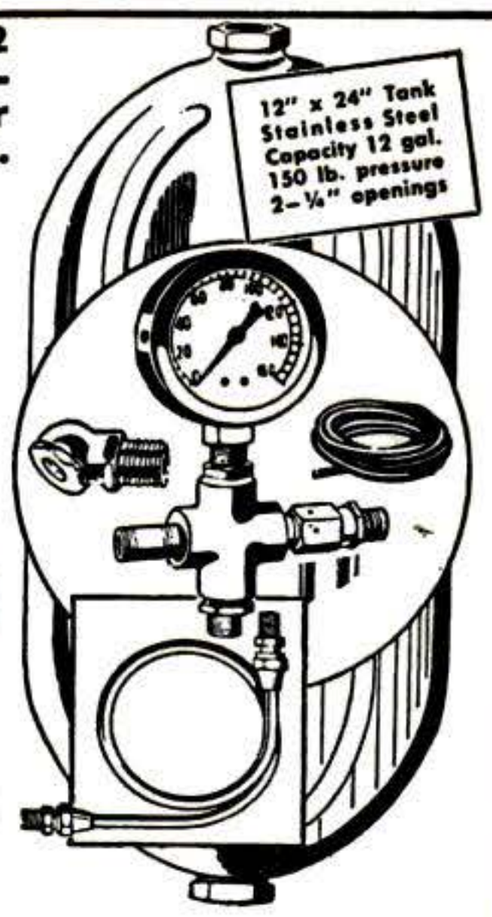

Compressor, pressure tank, air gauge, air chuck, 20-ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 4-way cross and 3 nipples. COMPLETE OUTFIT, wt. 52 lbs.

Equipment less Compressor, $10.95. Compressor separately, $21.50

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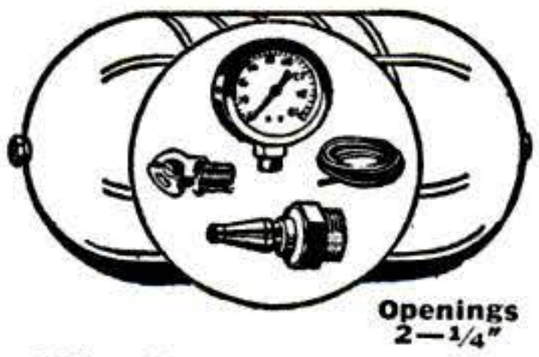

Complete outfit, ship.wt. 20 lbs. **$6.95**

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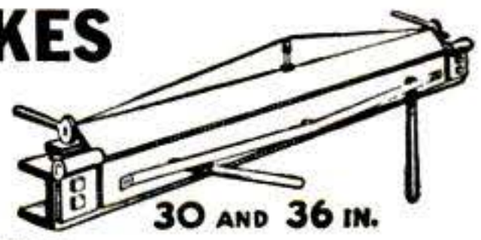

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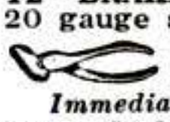

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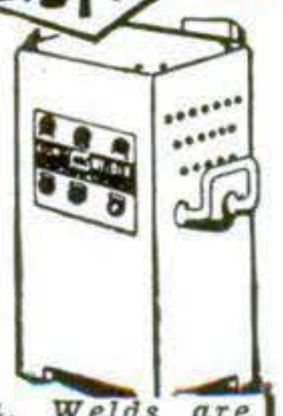

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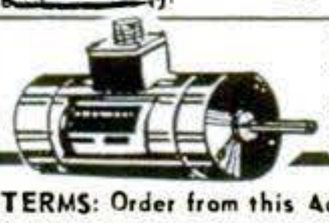

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5/32"	5¢ ft.	1/2"	15¢ ft.
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#330	.064	1/16"	36"	2.39
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Even an inexperienced operator can get professional results with the Worksaver kit and exclusive 2 Speed Right Angle head. Buffs, sands, grinds, polishes car body, woodwork, furniture, floors, metals. For home and shop use, garages and body shops, farms, service stations, machine and cabinet shops, building maintenance and other uses. Right angle head contains heavy duty, steel cut gears, packed in grease. Will give long hard use. Complete kit contains:

Right-angle drive 2 speed unit
Flexible molded rubber head
Direct drive adaptor, cup washer, screw
Polishing bonnet, highest grade lambs wool
Heavy-pile carpet compound rubbing pad
Three sanding discs—coarse, medium, fine grits
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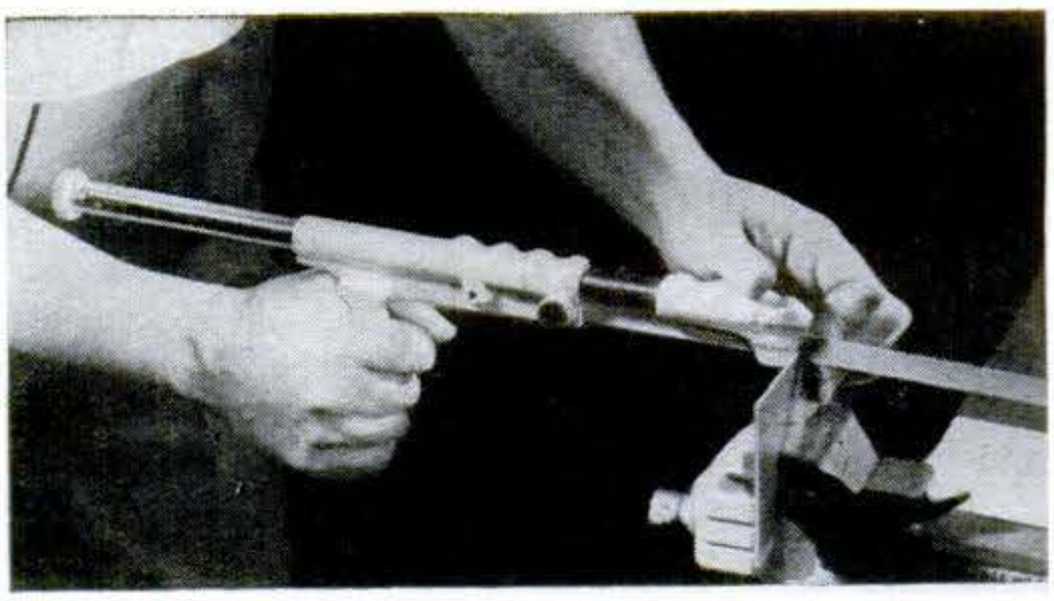
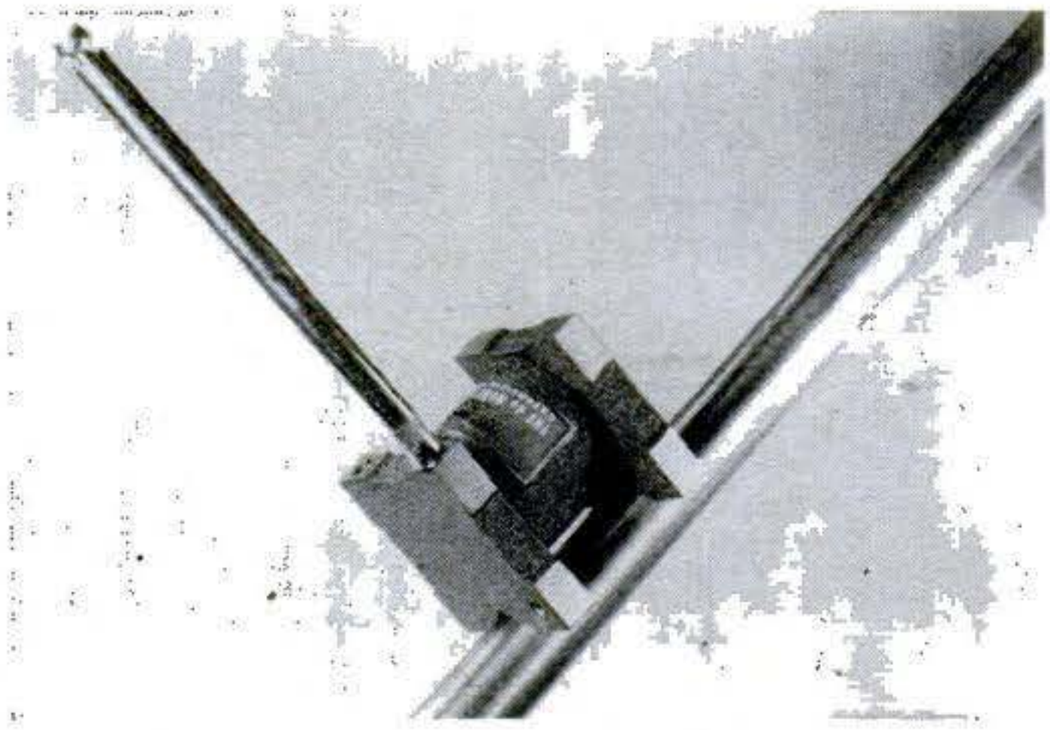


Hacksaw Is Spring Loaded. Here's a radically new hacksaw that lets the blade do its work without interference from the frame. Cuts well in from the edge of the stock are possible. A spring enclosed in the barrel returns the blade after each stroke. Made in England, the tool is sold in the United States for about $4 by Ziskind Co., Inc., New York City. With a starting hole, the saw can be used to cut out sections of floors, wall panels, or doors. The saw takes either 10" or 12" blades. The back of the blade is clamped in the pistol-grip section, and at the front end of the frame it rides between three hardened steel balls.



Magnetic Base for Gauges. The base of this machinist's measuring attachment is an Alnico permanent magnet with a 40- to 50-lb. grip on all four sides. Interchangeable brass shafts—7/32" and 5/16" in diameter—are provided for a dial indicator or height gauge. The base has V slots on one side for holding to a round surface. Manufacturer of the attachment is the du Mont Corporation, of Greenfield, Mass.

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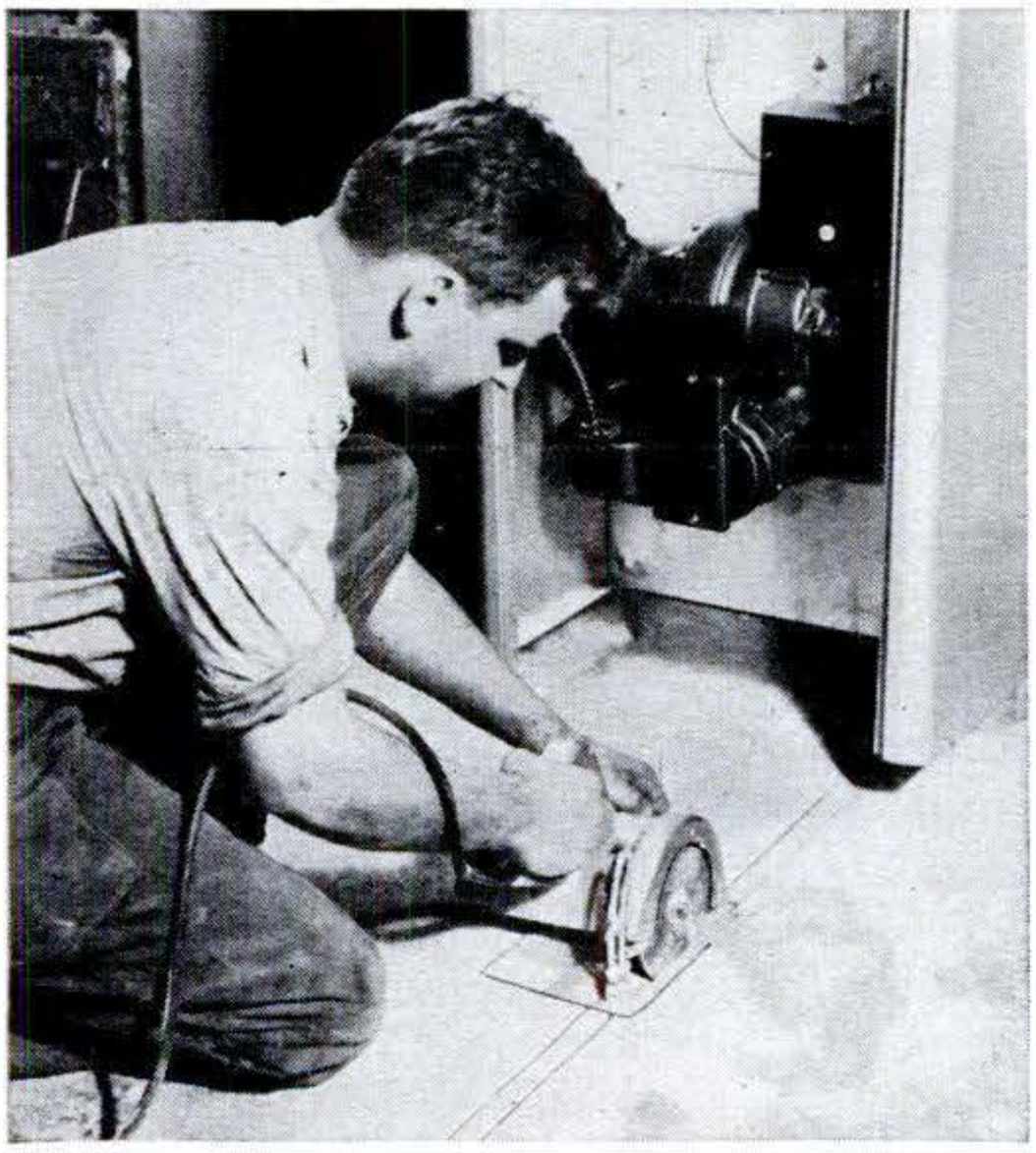
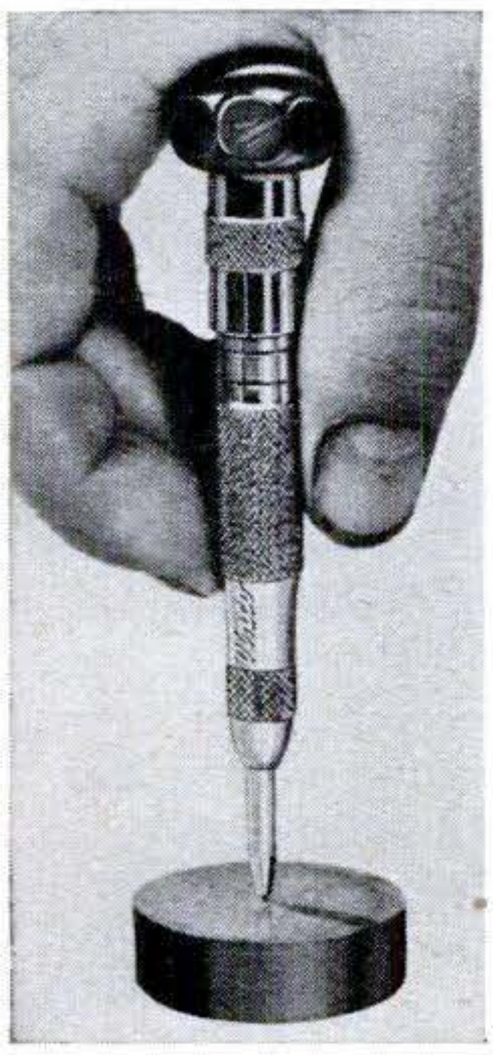
Tools

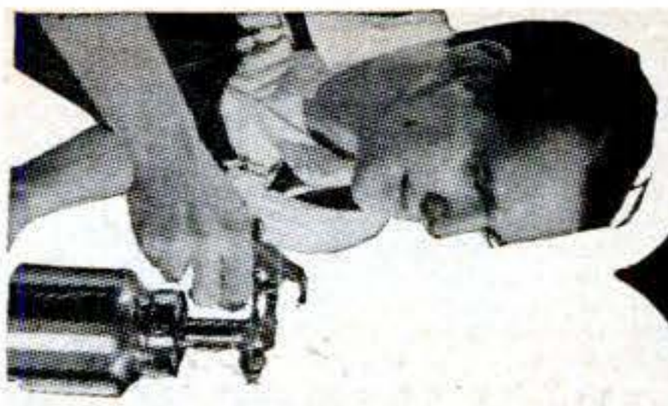


Electric Hand Saw. In the photo above, a groove is being cut in a concrete floor with a 6″ portable electric saw fitted with an abrasive wheel. After the cuts were made, the concrete in between was knocked out and a copper oil line laid. Maker of the 1-hp. saw is the Milwaukee Electric Tool Corp., of Milwaukee. Fitted with a 6″ steel blade, the saw also cuts wood and metal. Maximum cut is 2″ and it makes miters.



Automatic Punch. Feature of this spring-actuated center punch is the micrometer-type adjustment that varies the impact pressure from 5 to 35 lb. In addition to the standard layout point of tool steel, there are accessory points available, including a tungsten carbide one for hard steel and another for riveting. The maker is Vinco Products, Asbury Park, N. J.

Speedy Sprayer



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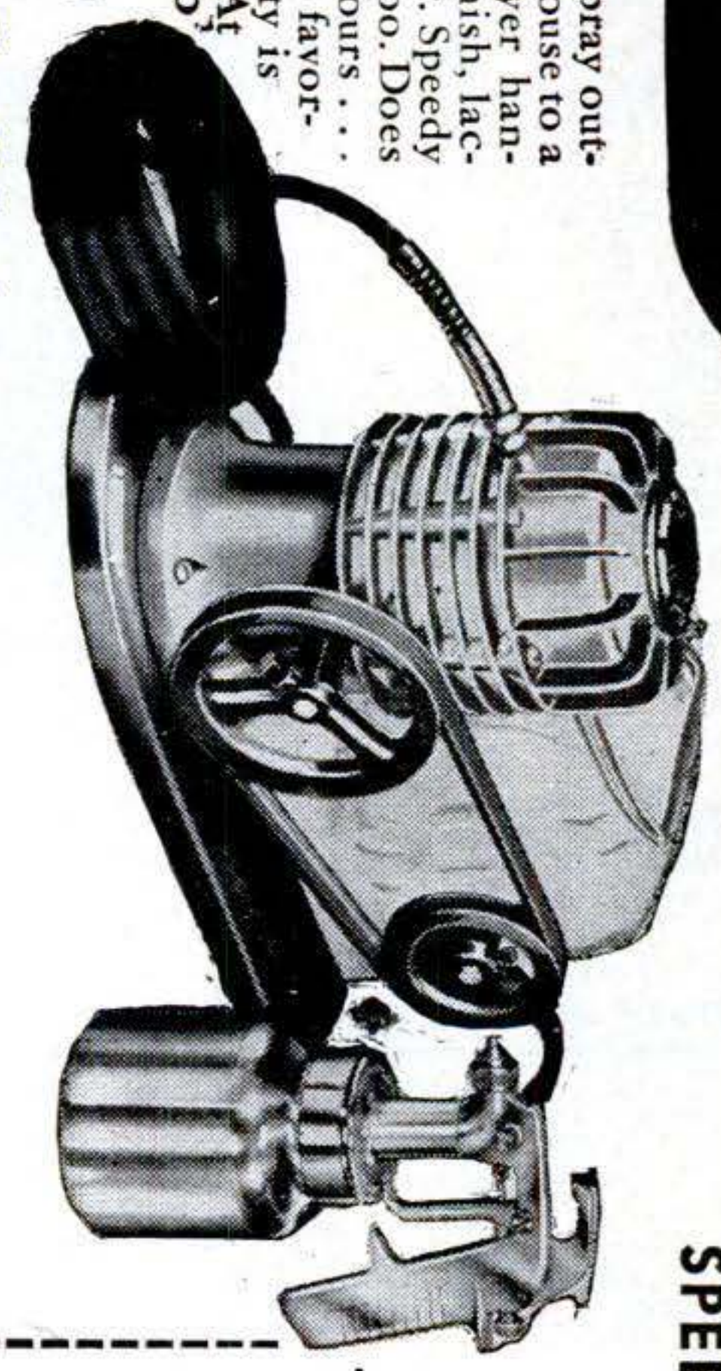

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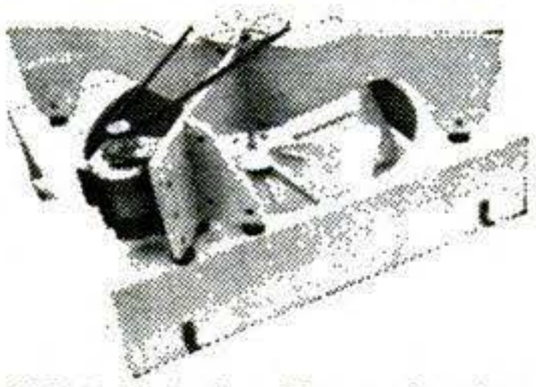

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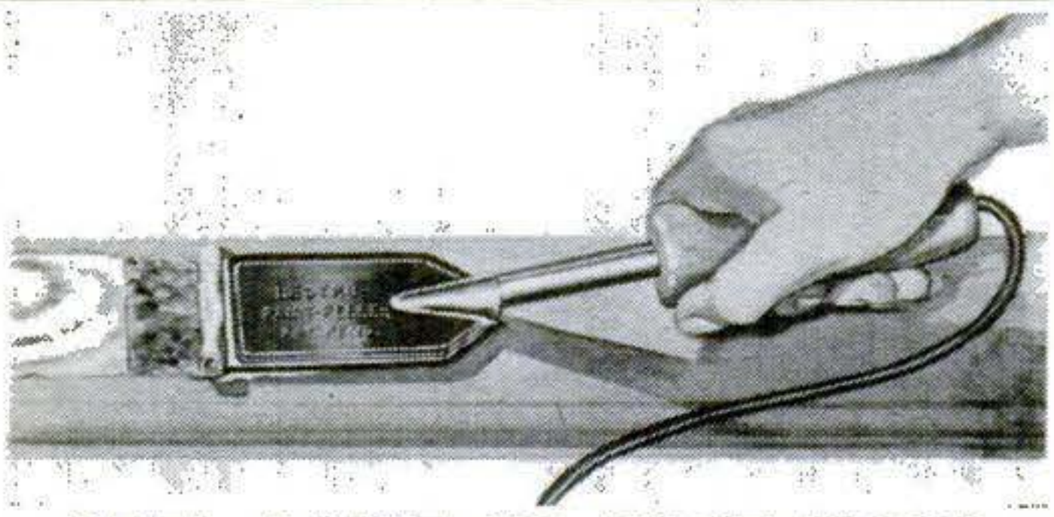

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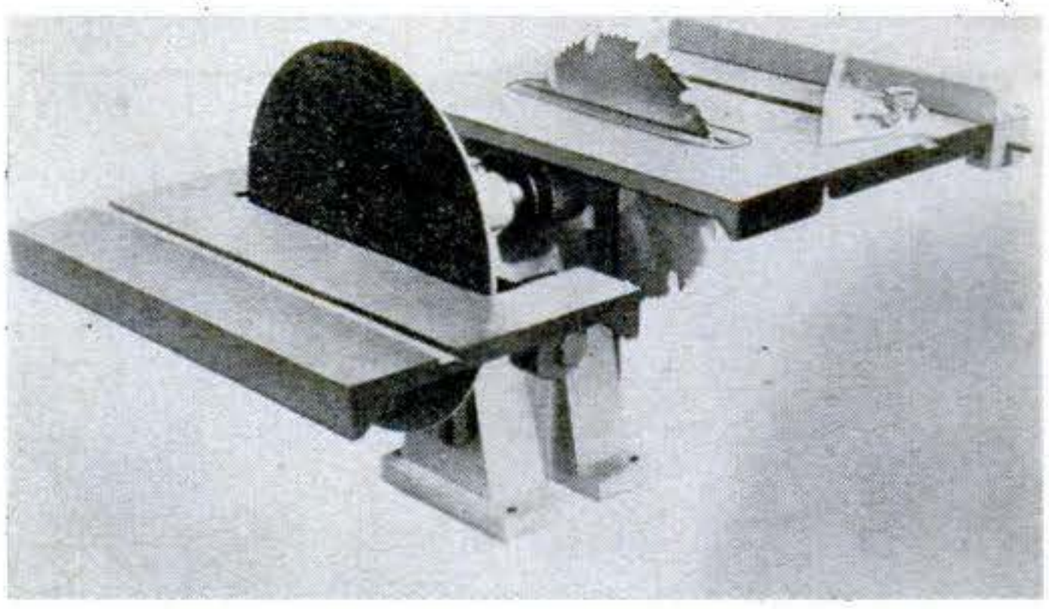
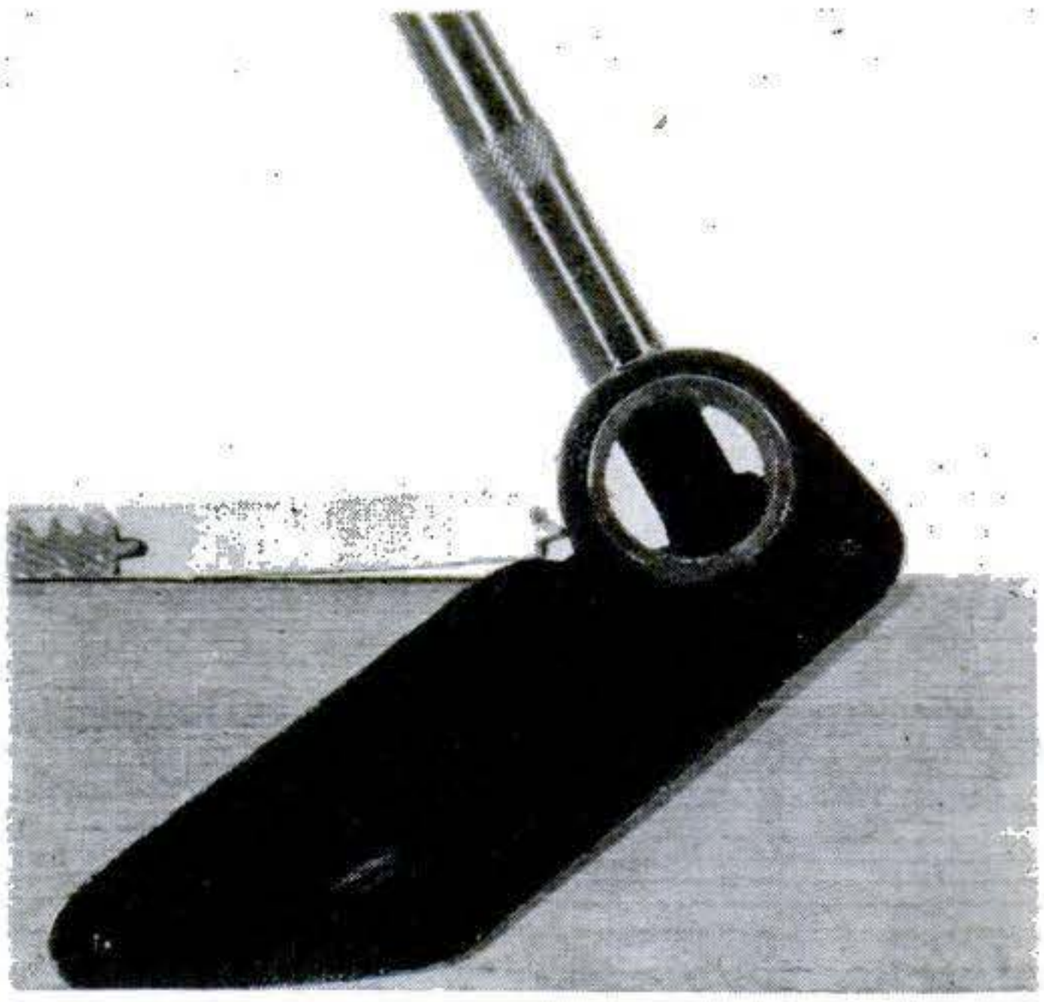


Sander Combined with Saw. Duo-Master Industries, of Sparta, Mich., prices this combination 8" bench saw and 9" disk sander at $27.50. The unit includes rip fence and miter gauge. Both tables tilt from zero to 45° and both can be removed for mounting accessories. The saw table is adjustable in height for cutting dadoes and rabbets. Weight of the unit is 16 lb. and the over-all dimensions are 12" by 13½" by 21".



Bar Salvages Lumber. This wrecking bar is designed for the removal of old flooring, siding, and sheathing without damaging the tongue and groove. It's made by Decatur Steel Products, of Decatur, Ind. A thrust of the steel lever first raises the tongue side of a board and then draws it outward and disengages it from the next board. It can be used astraddle single joists or adjacent to double joists. The bar weighs 6½ lb., is 25" long, and handles boards up to 8" in width.

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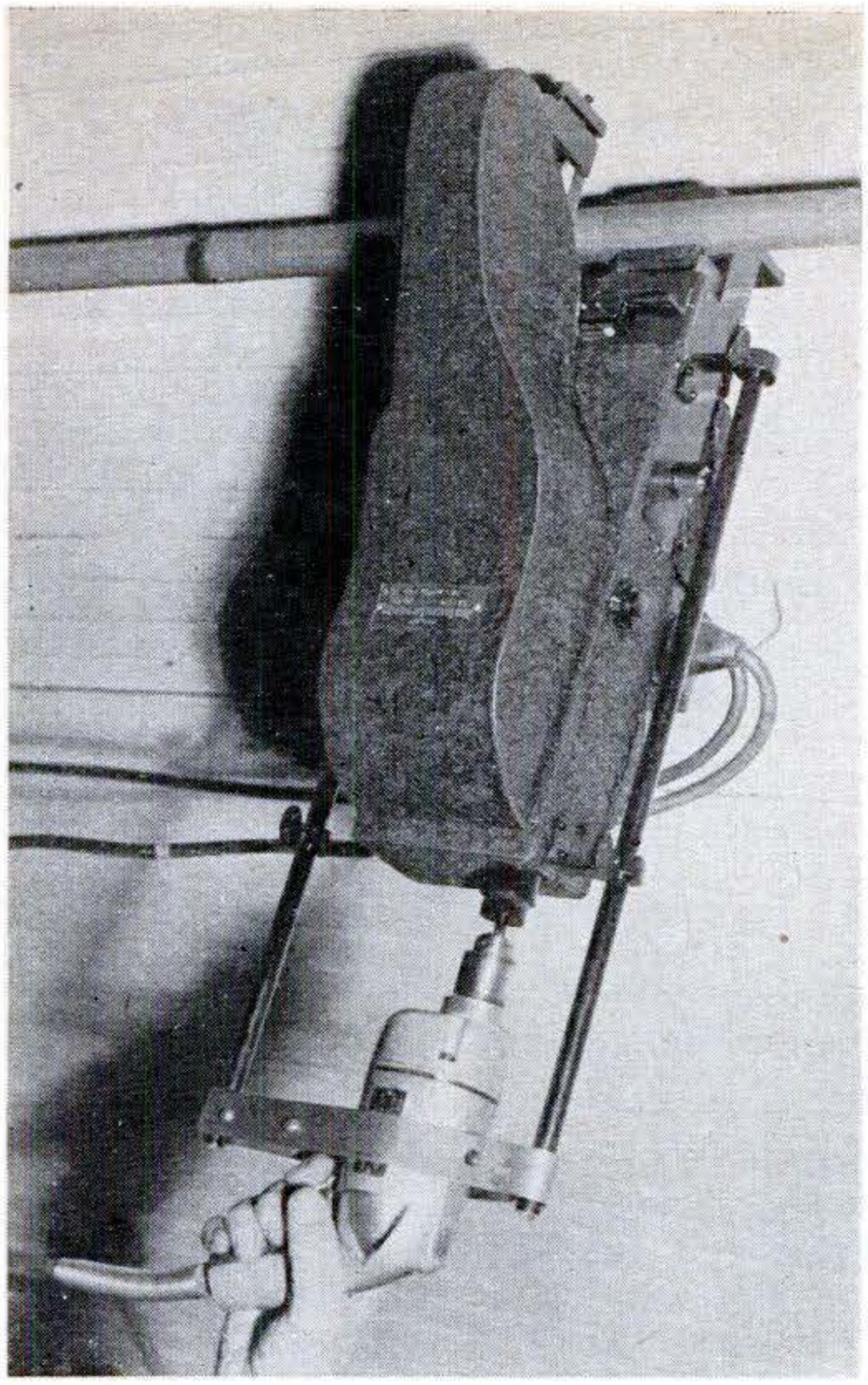
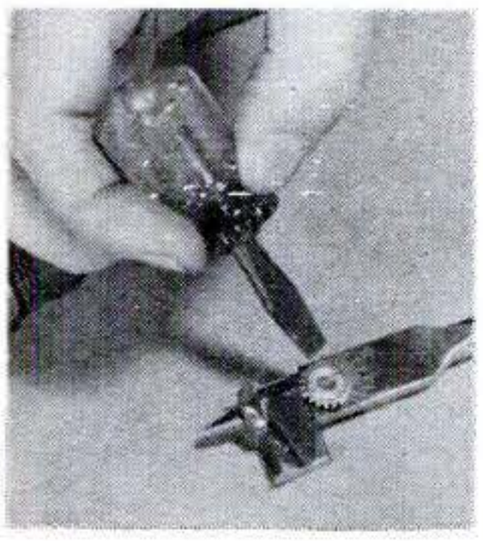


Power Hacksaw Is Portable. Powered by any standard electric drill, this hacksaw cuts pipe or metals up to 2″ in diameter. The Zina Goodell Corp., of Salem, Mass., prices the tool—less drill—at $75. The saw weighs about 22 lb. but is easy to use because it is clamped to the work. It takes a standard 10″ blade, has a 5″ stroke, and delivers 200 strokes per minute when the drill speed is 1,250 r.p.m. For light work that's easily portable, the saw can be locked in a vise and used as a bench tool.

Expansive Bit Has Dial. Diameters can be accurately and quickly dialed with this expansive bit made by the Irwin Auger Bit Company, of Wilmington, Ohio. The bits are available in two sizes with cutting ranges from ⅝″ to 1¾″ and from ⅞″ to 3″. Graduations on the dials are by 16ths of an inch. The bits are drop forged and heat treated for the full length.



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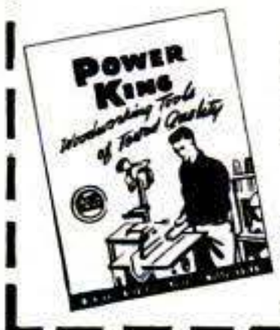

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P.S. Last minute news & notes...

AUTO NOTES: Look for at least one switch from straight to V-8 engines, and from coil back to flat springs, among the major makes. . . . A new model with an old nameplate, to be announced soon, will be more than the expected "face lift," will include many styling and mechanical changes. . . . The trend to higher compression continues--a 7.8-to-1 ratio is on the way.

A SMILE may be worth more than 10,000 words in the next presidential campaign, says David Sarnoff of RCA. By then, he expects 20,000,000 television sets to be tuned in on coast-to-coast networks, making it possible for 80,000,000 persons to see as well as hear the candidates.

RUBBER FENDERS are being substituted for the metal ones on all Detroit street cars. They are mounted over the wheels of each truck to protect electrical gear from mud and grease. . . . A RUBBER COMPOUND that can be mixed with tar has also been developed, to protect airport runways from the dire effects of the fuel spilled by jet planes.

A SUN-HEATED HOUSE requiring only 10-percent auxiliary heat is perfectly feasible around Boston. That's the advance report on data to be revealed at a symposium at M.I.T. this month. The M.I.T. experimental house (PS, Mar. '49, p. 106) now has its first full winter season behind it. . . . Meanwhile Dr. Maria Telkes is keeping her Dover, Mass., sun house at a cool 72° all summer by reversing the cycle of her chemical heat-storage system. She also reports that she's eager to build a $10,000 house to show the practicality of heating low-cost homes by solar radiation. The house in Dover has been heated entirely by the sun for two winters.

500,000,000,000,000,000,000,000,000,000,000,000,000,000 YEARS from now half of the radioactive atoms of Tellurium 130 that are now being studied will have decayed, but the other half will still be "hot." Until Argonne National Laboratory researchers came up with this figure, the stuff was supposed to be stable. . . . WHEN LOST in the rough, golf balls containing radioactive materials can easily be found with a Geiger counter. The balls were made by B. F. Goodrich researchers as a stunt--not for sale.

ODORS can be neutralized now with a tiny 4-watt lamp bulb that gives off ozone. The new lamps, made by GE, are being put in automatic clothes dryers now, but can also be used in kitchens, baths, and cellars.

SPRAY BOMBS containing plastic-covered aluminum particles can be obtained now. All you have to do to put a new decorative weatherproof coating on metal fixtures is press the cap--and wave your hand to distribute the stuff evenly. Chamberlain Metal Products, 1466 West Madison St., Chicago, makes them.

RADIO SIGNALS marred by static or fading are re-sent automatically now on RCA's radioteletype circuits between New York and Holland. The innovation is called ARQ (automatic repetition request). At the transmitter a memory unit made of 21 condensers holds each signal a fraction of a second--so it can be repeated when the receiving apparatus "asks" for it.

COLLAPSIBLE TUBES such as toothpaste comes in may soon be used as containers for catsup, mustard, peanut butter, jelly, etc. . . . . A NEW ZINC ALLOY with the strength and electrical characteristics of brass has been developed for possible use in lamp sockets and bases. . . . THE ARMY will slick up 2,000,000 pairs of combat boots, left over from the war, by coating them with a plastic that keeps out water and takes a shine.

The Editors

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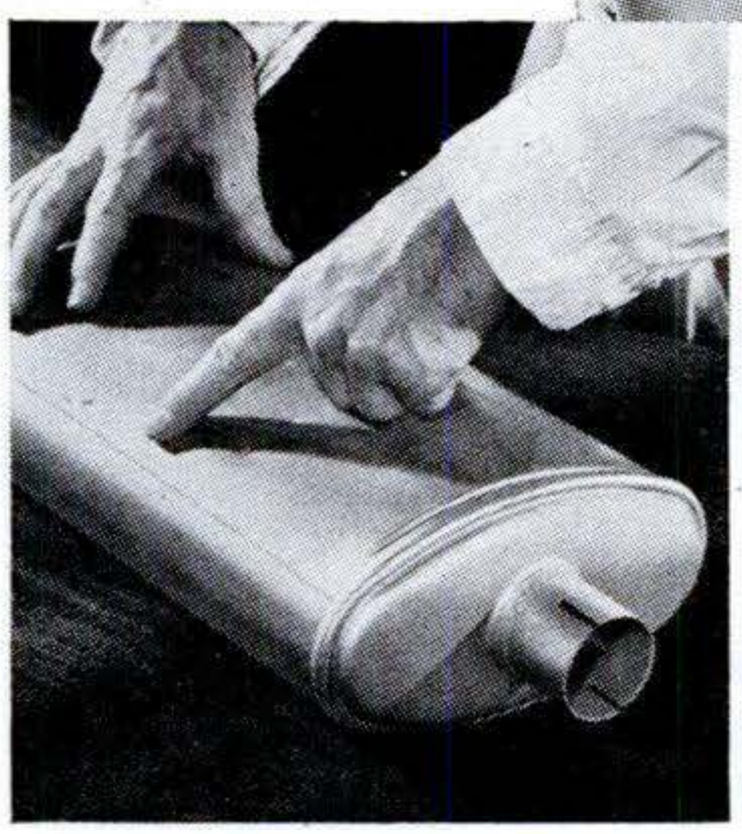

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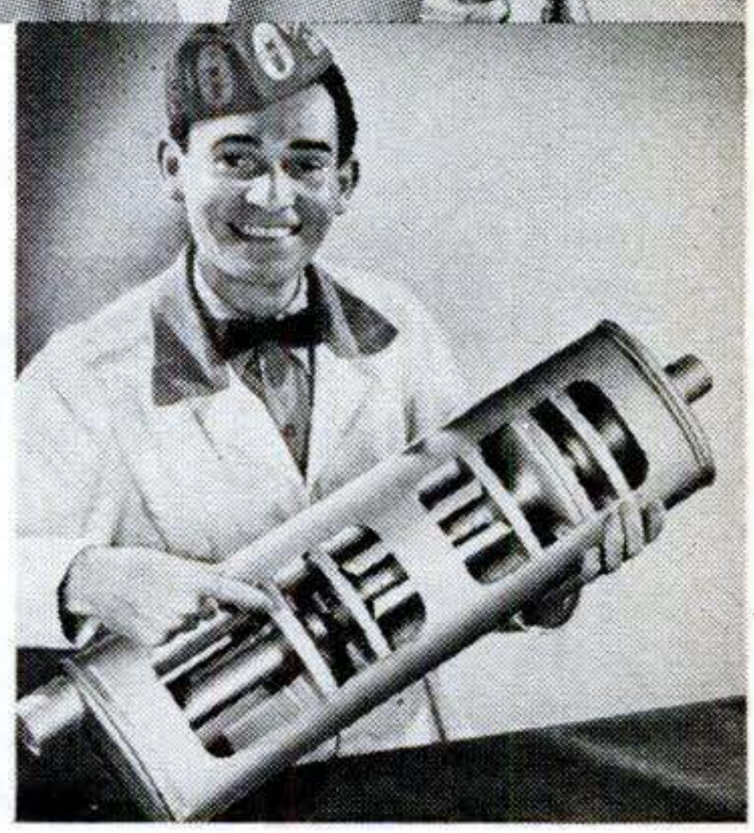

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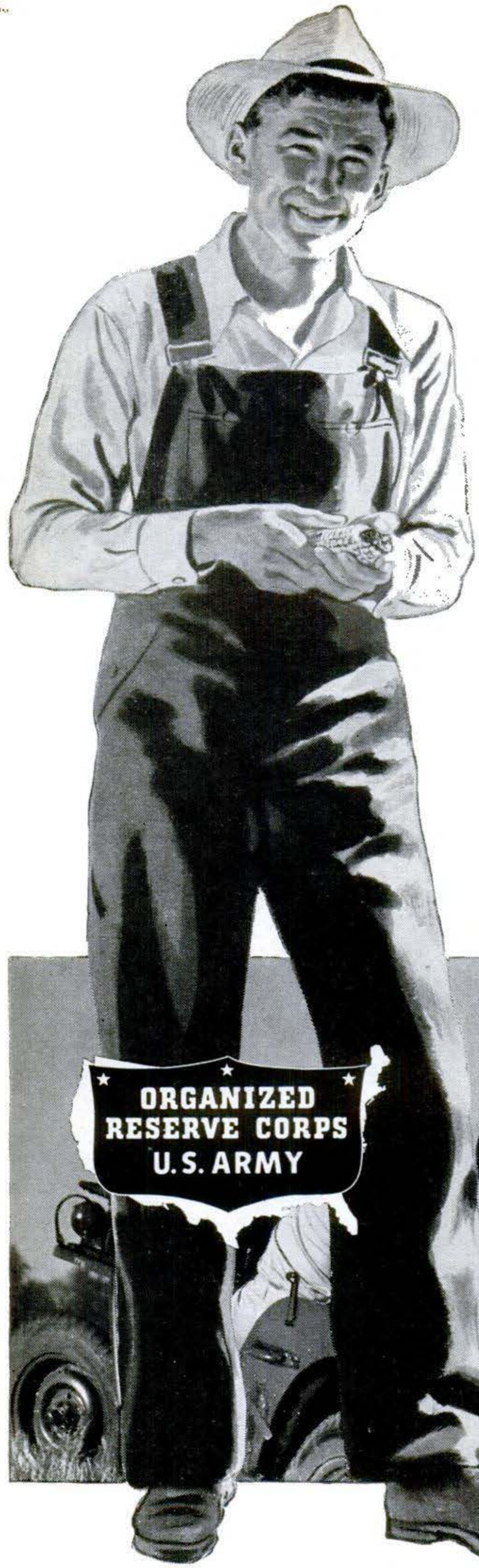

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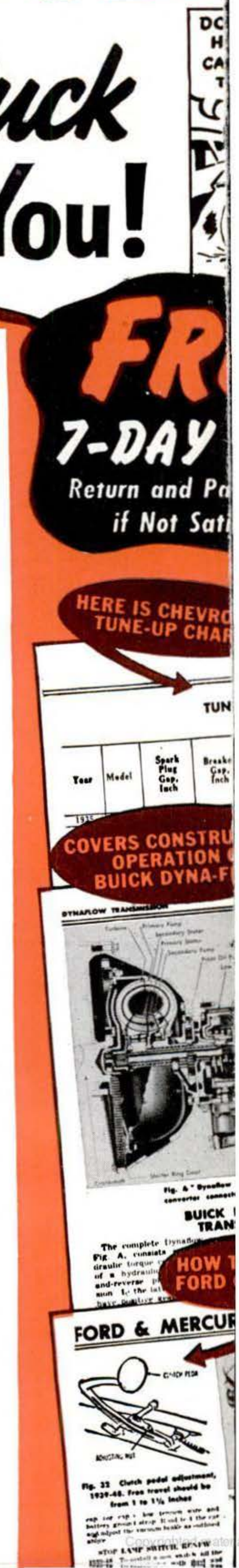

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